CONTRIBUTIONS TO

WESTERN BOTANY.

NO. VII.

BY

MARCUS E. JONES, A. M.

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BY MARCUS E. JONES, A. M.

Having had an opportunity to examine the material in the National Herbarium I have been able to correct many errors, and possibly to make a few more. The following notes and new species are the result of those studies, and are only such as have come to light from the identification of my collection of 1894 made under the auspices of the U. S. Dept. of Agriculture as Special Field Agent. The long delay in the publication of the report necessitates the early publication of the new species. The number of new species and varieties discovered by me in 1894 and described here are 104, those collected and named but also found before by others are 29, a total of 133 new species and varieties in the collection. Other new species and varieties described from other sources are 57, a total of 190.

The collection of 1894 consisted of about 50,000 specimens and 1700 species, there being 1106 species and varieties in the sets, to these I have added in the sets which I will distribute about 50 others collected in 1893 and 1895. A very large amount of material was collected as the basis of an extended report on geographical distribution and plant adaptation; this material it is my intention to work up at some future date in connection with similar material gathered in the Great Basin since 1879.

The types of the new species are in my herbarium unless otherwise stated. Duplicate types of all species in the collection of 1894 are also in the National Herbarium.

New species signed "T. & E." are by Tracy and Earl.

New species signed "E. & E." are by Ellis and Everhart.

All numbers above 5000 belong to the collection of 1894.

In nomenclature I have tried to follow the recent circular signed by the representative body of American botanists, and not the peculiar nomenclature of "A Committee of the Botanical Club, American Association for the Advancement of Science." My reasons for doing so are that the circular is the first and only agreement of American botanists on nomenclature since the death of Dr. Gray; that it represents my own views with the exception of some unimportant particulars; that the "List of Pteridophyta and Spermophyta" prepared by "A Committee" represents the views of only a portion even of that "Committee;" that it is not representative; that it when published was not sanctioned by the "Botanical Club" or the American Association; that it is the product of a few practically self-appointed individuals; that it does not meet the views of American botanists; that it degrades the rank of species and genera and opens wide the flood gates for the indefinite multiplication of fictitious species and genera by those who have practically no field knowledge, who have of late been manufacturing species in the herbarium; that it destroys the relative standing of genera, species and varieties by elevating the latter to specific rank, by making genera of intimately related natural groups of species and thus destroying the subgeric relationship while leaving nothing in its place but a multitude of fictitious genera of no apparent relationship; that in the use of names it professes that priority whether varietal, specific or generic shall rule, while at the same time repudiating it by insisting that no earlier date shall be used than the Species Plantarum of Linnæus; that in "Once a synonym always a synonym" the bibliography of species, etc., is to be loaded up with a mass of new names nine-tenths of which are wholly useless, which will require thousands of changes of well

known names and thousands of dollars expense in renaming herbaria with absolutely no compensating advantage. I have used double authorities when there are any because I believe it more just. I have followed the order of Gray rather than that of the Pflanzenfamilien for convenience and not because I believe it better, for I prefer the latter.

In three cases I have deviated from the letter of the circular referred to above, because I believe ultimately some date near 1885 will be fixed in which varietal names shall supersede specific ones in the same genus. Should this not be done the following will be the nomenclature of the three species: *Astragalus ceramicus* Sheldon for *A. angustus* and its varieties (the name *foliosus* Gray used as a variety, *foliolosus* Sheldon not Gray, having been given prior to 1885); *Astragalus salinus* Howell for *A. latus* Jones; *Hedysarum boreale* var. *flavescens* (Coult. & Fisher) for *H. boreale* var. *leucanthum* Greene.

CLEMATIS VERTICILLARIS var. COLUMBIANA (Nutt. Jour. Phil. Acad., vii, p. 7).

Clematis Columbiana, Nutt. l. c.

No. 5571. July 3, Provo, Utah, in Slate Cañon, 8000° alt., on moist slopes, among oak brush.

A comparison of many specimens in the National Herbarium, from various localities, together with my own throughout the Plateau region, makes it clear that this is a well marked variety, being characterized by the usually entire or crenulate (rarely toothed) leaflets and different fruit. I have seen but one transition specimen, from Minnesota. The typical species ranges from the Atlantic to the Rocky Mountains, and the variety ranges thence westward to the coast.

Akenes obovate, about 1″ long and ¾″ wide, with apex crowned by the long tail, which is very slender, and

scarcely enlarged below; akenes usually obtuse at apex, never acuminate; sparsely pubescent below, much pubescent above; tail 2′ long; mature peduncles about 5′ long; leaflets thin, shortly acuminate.

Clematis verticillaris DC. has coarsely and sparsely dentate, ovate, shortly acuminate leaflets, which are often trifid; fruiting peduncles 2–3′ long, reflexed; akenes 1–1½″ long, obovate, with a broad and flat border, which tapers abruptly into a flat wide tail, which gradually narrows upward; akenes nearly equally hairy throughout, and sparsely so, nearly twice the size of those of the var. *Columbiana*.

CLEMATIS DOUGLASII var. BIGELOVII (Torrey, Pac. R. R. Rep., 4, 61).

Clematis Bigelovii Torrey l. c.

I can find no characters which separate this from *C. Douglasii*. Palmer's specimen from New Mexico has the long peduncle and flower of *C. Douglasii*, has three distinct pairs of leaflets besides the terminal one; the lower pairs are again 3–parted, and the divisions stalked (lateral stalks 2″ and terminal one 6″ long), making the leaf 2-ternate, the leaflets are again cut-toothed or parted into acute segments, whose general outline is ovate to lanceolate, 6–12″ long; petioles of the main pairs of leaflets 1′ long; leaflets nearly glabrous; petioles, etc., decidedly pubescent; inner sepals woolly.

Newberry's specimen from McComb's Expedition has leaflets of *Douglasii*, but broader, the fruit is that of *Douglasii*.

Lemmon's specimen from Arizona has filiform segments, but in other respects is *C. Douglasii*.

Shufeldt's specimen from Fort Wingate, New Mexico, has oblong-ovate leaflets, 6″ or less long, mostly entire, shortly acute, and giving a wholly different appearance,

but is manifestly only a form of *C. Douglasii.* These specimens are in the National Herbarium.

Anemone Tetonensis Porter.

No. 5763. August 7, Fish Lake, Utah, 10,800° alt., on gravelly knoll, devoid of trees, in the midst of a heavy forest of spruces and firs, along with *Anemone multifida*, but never showing any tendency toward intergrading with it.

This does not accord with Mr. Britton's description, but does accord with a part of the material on which Mr. Britton founded his description, *i. e.*, Bailey's specimen. It would seem that Coulter's specimen is either a form of *A. multifida* or is a transition form between the two. There was every facility for hybridization, and yet no trace of it where I collected my material, though I hunted for it for nearly an hour and saw hundreds of specimens. All specimens have long, not "short" styles, and akenes barely pubescent on the backs, flowers white; segments of the leaves narrower and half longer, tapering and very acute at both ends; petioles of bracts shorter for the blade; whole plant more strict and not weak. The other characters given for *A. Tetonensis* do not hold. The sepals are bluish outside and pilose, especially below, oval, 3″ long, not open much, anthers oval and apiculate; styles 2″ long, glabrous above, curved but not reflexed; heads oval, 3″ high; plants 6–8′ high, erect and not slender, tufted; stems 2–5 from the apex of an upwardly bent rootstock; dead leaf sheaths present.

Ranunculus Cusickii. Referred provisionally by Watson to *alismæfolius* var. *alismellus*, and by Holzinger to *hydrocharoides*. Root leaves nearly round to ovate, cordate or truncate at base, obtuse, entire, 1′ long, edges barely sinuate, on petioles 1–3′ long, with dilated bases; stem leaves 1–2, similar and short petioled or nearly

sessile; bracts lanceolate, entire, 6″ long; flowers on long (2–3′) slender peduncles, yellow; petals obovate-oval, veiny; akenes in a small globular head ½″ long, inflated, very obtuse, as in var. *alismellus*, with minute beak; whole plant glabrous, erect, 6–8′ high, slender, but stems rather thick below; roots fleshy-fibrous. The type is No. 1161, Cusick, Eagle Co., Or., 1884, 6000° alt. I also refer to this Watson's specimen from below Lobo Divide, Idaho, Aug. 20, 1880.

RANUNCULUS JUNIPERINUS.

No. 5011. April 4, at Copper Mine, 18 miles west of St. George, Utah, in Beaverdam Mts., 5000° alt., among junipers, in loose gravelly soil.

No. 5139x. April 30, at the head of the west branch of Santa Clara valley in the Beaverdam Mts., Utah, 5000° alt., in loose soil on rocks, among junipers.

Perennial, with many long, rather fleshy fascicled roots from the crown and when the crown is prolonged then there are many roots growing out from the axils of the old leaf-sheaths; plants densely tufted with many crowns which are covered with dark, long, narrow and rather fibrous leaf-sheaths 1½′ long; stems about 8–12′ long and generally erect; leaves rather fleshy and doubly-pedately-parted, the lobes variously toothed or lobed; petals white at first, veined on the outside with pink, when old becoming purple and enlarging, 5–8″ long, oval to orbicular, with rather uneven margin, veins very prominent, often rotate-spreading, usually cup-shaped; stamens many, with minute round anthers; sepals concave, veined, greenish, almost hyaline, only the claw reflexed, broadly-ovate, obtuse, enlarging with age and closed over the fruit, both petals and sepals persistent; flowers 2–3, long-peduncled, always with a leafly bract at the base of the peduncle, but with no other stem leaves; fruit flat with a

thick marginal nerve, not at all inflated, 1–1½″ long, nearly 1″ wide, broadly obovoid and obliquely so, minutely apiculate; style minute; seed curved, nearly 1″ long, oblong-obovate, very much smaller than the akene; akenes many in a head. This is *R. Andersoni* var. *tenellus* Wats., but Mr. Watson seems to have failed to recognize the great difference in the akene.

This grows on gravelly mountain sides among the rocks and junipers, and is the earliest bloomer of all flowers.

DELPHINIUM SCOPULORUM var. ATTENUATUM.

No. 5893d. August 23, Head of Bullion Creek, Utah, near Marysvale, 11,500° alt., on gravelly and springy places along cold subalpine streams.

No. 5684c. July 25, Mt. Ellen, Henry Mts., Utah, 10-000° alt., in similar situations.

This has the wide leaves of the variety *glaucum* as well as the large flowers, it has the viscid pubescence of the variety *subalpinum;* sepals linear and attenuate, 12″ long, about 2″ wide at base, three times as long as the petals, nearly glabrous; spur shorter than the sepals, about 10″ long, ascending; racemes compound below; flowers deep blue. This approaches nearest to *D. elatum* of any American form, but the petals of that species are very dark and the sepals wider; in this species the upper petals are white and veiny and the lower light-blue and hairy.

This grows at timber-line along brooks, has a very strong odor of musk, and grows in large tufts about a yard high.

No. 5759 is a transition form toward the type. Gathered August 7, Fish Lake, Utah, 11,000° alt., in hollows near snow banks.

Delphinium pauciflorum var. *depauperatum* (Nutt.) Gray. My specimens No. 5391, June 5, 1895, Marysvale, Utah, in Bullion Cañon, 9000° alt., in gravel, have

the roots of this and the habit and flowers of *D. bicolor*, so do many from Colorado. The following numbers are much alike also:

5409a. June 7, 1895, Marysvale, Utah, in gravel, 6000° alt.

5441a. June 15, 1895, Ireland's Ranch, Salina Cañon, Utah, 8,000° alt., in gravel.

5176a. May 4, 1895, Silver Reef, Utah, in gravel, 6000° alt.

It is well nigh hopeless to try to bring order out of the chaos in this genus for half the recognized species run together.

Aquilegia flavescens Wats. King's Rep. 5, 10.

No. 5911h. August 25, Tate Mine near Marysvale, Utah, 9300° alt., along Bullion Creek among willows.

No. 5338b. May 31, Marysvale, Utah, in marshy places, 6000° alt.

An examination of the type specimen as well as the original description shows that Mr. Watson took for the type of his *A. flavescens* what he has since regarded as only a form of *A. cærulea* and which certainly intergrades with that species. The plants which he has referred to this species, which grow at a lower altitude, are quite different and characterized by very short and hooked spurs, very small flowers, hardly more than 6″ long, always yellow; upper leaves reduced to minute bracts; stems very long, 1–3° long, slender, at least three times as long as the short and small leaves. It is probable that the labels of the two species have been changed in the National Herbarium, but must have been changed by Mr. Watson himself before his descriptions were drawn up, for the plant which he calls "subalpine" form is seldom found higher than 7500 ft. altitude, but is common as low down as 6000 ft. altitude along streams, while the

view of the great variability in this genus and in view of the peculiar soil in which it grows, I prefer to consider it as a mere variety. Found growing among the spruces at 8000 feet altitude, on the most barren clay soil.

Platystemon Californicus Benth. This is *P. crinitus* Greene, but the characters given by Greene do not hold out. No. 5121. Jones, Diamond Valley, Utah, April 28, 1895, 3500° alt., in sand.

Cardamine cordifolia Gray.

No. 5341. June 1, 1894, Marysvale, Utah, 7000° alt., in cold spring.

This is a form with stems and often the leaves short-shaggy, with white hairs.

Cardamine cordifolia var. *incana* Gray.

No. 5341a. June 1, Marysvale, Utah, 7000° alt., in gravel, in cold springs.

Very pubescent above, with spreading white hairs.

Arabis hirsuta var. *glabrata* T. & G., Fl. 1, 80.

No. 5683. July 25, 1894, Mt. Ellen Park, Henry Mountains, Utah, 9000° alt., in gravel.

No. 5743b. August 4, 1894, Fish Lake, Utah, 9000° alt., in meadows.

No. 5601b. July 6, 1894, Soldier Summit, Utah, 7300° alt., in gravel.

No. 5537c. June 29, 1894, Thistle, Utah, in gravel, 5300° alt.

No. 6054e. September 17, 1894, Nagle's Ranch, Arizona, Buckskin Mountains, 7800° alt., on the edge of streamlets from springs.

No. 5731f. Fish Lake, Utah, 9000° alt., in gravel.

This seems to be a well-marked variety, differing from the typical *hirsuta* of Europe in the leaves being either entire or sparsely dentate, while the European plant seems to be characterized by very long and often hooked teeth,

making the leaf appear almost laciniate. I have seen no true forms of the typical species in the United States, except a few found along the eastern base of the Rocky Mountains, in Colorado and Wyoming.

ARABIS ARCUATA var. PERENNANS (Pringle, Watson, P. A. A. 22, 467).

It is impossible to separate this from typical *A. arcuata*, though extremes seem sufficiently distinct. Coville's No. 1747 is surely a reduced form of this; root leaves oblanceolate, entire, 6–8″ long, rosulate; stem leaves oblong to oblanceolate, sessile, or nearly so, acutish, reduced above; racemes 3–5′ long, rather closely flowered; pods a little arcuate, and below horizontal on recurved pedicels, 1–1½′ long, 1″ wide, barely acute; pedicels slender, 2″ long; seeds obscurely in two rows, narrowly winged above and not at all at very base, oval, ⅓″ long; plants cæspitose and many stemmed. Watson's specimen from the Uintas, at 12,000° alt., is taller and more lax, with longer root leaves, otherwise about the same. Rose's specimen from the Yellowstone Park is the same. My No. 5330, from Marysvale, Utah, May 31, 1895, 6000° alt., in gravel, has longer pedicels and wingless seeds, but I fail to find any valid separating character.

DRABA NEMOROSA var. STENOLOBA (Ledeb. Fl. Ross. 1, 154).

There is no character assigned by Watson for this species which holds; generally the pods are linear-oblong and acute at each end, usually curved most on the outer side, and about as long as the pedicel, glabrous, but all these vary, some pods are half the pedicel or even a third the pedicel, others are longer; some are oblong-ovate, and some are blunt at apex, all ours are annuals. *Draba hirta*, at least specimens so named, from Spitzbergen, is perennial with twisted pods.

ERYSIMUM LINIFOLIUM (Nutt. T. & G., Fl. 1, 91).

Sisymbrium linifolium Nutt. l. c.

No. 5485. June 23, Castle Gate, Utah, 6000° alt., in gravel, along the river in open places in the juniper belt.

No. 5486b. Same locality as above.

No. 5309. May 28, Tropic, Utah, 6000° alt., in fields, in gravel.

It has always seemed to me that this species is wrongly referred to *Sisymbrium* and more properly belongs to *Erysimum*. It is near to *E. cheiranthoides*, but verging toward *E. asperum*.

ERYSIMUM ASPERUM var. PARVIFLORUM (Nutt. T. & G., Fl. 1, 95).

This is certainly only a variety of *E. asperum* as given in Bot. King by Watson, though Watson's specimen is intermediate between this and the type.

Erysimum asperum var. *pumilum* Watson, Bot. King's Exp. is nothing but typical *E. asperum* as it is found on the Great Plateau; his specimen is biennial and not perennial.

Erysimum pumilum var. *perenne* Watson, Coville, Death Valley Rep. is not surely perennial, but seems to be an ordinary form of the type with orange flowers nearest to the var. *Arkansanum*.

THELYPODIUM WRIGHTII var. TENELLUM.

No. 5559. Provo, Utah, in Slate Cañon, on rocks, July 2, 1895, 6000° alt.

No. 5308ah. Marysvale, Utah, in gravel, 6000° alt., June 4, 1895.

Many stemmed from a perennial root, stem slender, intricately branching above, 2–3° high, retrorsely hispid below; stem leaves all entire or faintly sinuate toothed, thin and delicate, 1½–3′ long, lanceolate, obtuse, cuneate at base; pods 2′ long, almost filiform, knotty, with long

beak 1–2″ long, with a pseudostipe 1–2″ long; filiform, pedicels 4″ long, reflexed, rarely ascending; racemes 6–12′ long; root leaves and rarely, lower stem leaves lyrate.

STREPTANTHUS HOWELLII (Watson, P. A. A. 21, 445).

Thelypodium Howellii Watson l. c.

This seems to be a well marked *Streptanthus* nearest to *S. cordatus*. Leaves sagittate, broadly linear, acute, 1′ long, sessile, oblanceolate, sinuate toothed, root leaves with almost no petiole; stems ascending from the crown of a perennial root, 1–1½° high; racemes long and narrow, 1° long or less; flowers purple or purlish; sepals saccate, triangular-oblong, 3″ long, tips barely spreading; petals with narrow blade, twisted and coiled, twice the sepals, purple, claw enlarged below; anthers coiled, sagittate, 1″ long, exserted 1½″; immature pods with long beak, 1″ long, narrow; pods sessile, 1′ long, nearly erect; pedicels 2–2½″ long, greatly enlarged at apex; plants pubescent below and glabrous above. Has the habit of an Arabis. Harney Valley, Or., June 8, 1885, Howell.

CAULANTHUS CRASSICAULIS var. MAJOR.

No. 5685. Jones, Bromide Pass, Henry Mts., Utah, in gravel, on mountain sides, 9,000° alt.

Short lived perennial, 2½–3° high, erect, stems with barely a trace of inflation, simple but tufted, glabrous throughout; leaves 3–5′ long, clustered at the root, variously sinuate-lyrate-pinnatifid, with acutish often curved lobes below, terminal lobe half the whole leaf, lanceolate to oblong, 1–2½′ long, petioles shorter than the blade; stem leaves with still shorter petioles, linear to lanceolate, mostly entire, 2–3′ long, racemes naked, 1–1½° long or less; flowers about their own length apart and less than

half the pods apart in fruit; pedicels ½″ thick, 1½″ long, very stout, ascending, apex 1″ wide; pods sessile, 1″ wide, 3–4′ long, tipped by the capitate sessile stigma, erect; flowers yellow and tipped with purple, narrowly urceolate; sepals 3″ long, oblong-lanceolate, obtuse, scarcely saccate, tips recurved; petals linear, nearly double the sepals, recurved and twisted with purple center and white hyaline margins, blade scarcely dilated; filaments equaling the sepals, winged, widening below; anthers yellow, 1½-2″ long, linear, not coiled, falling away from the tips of the filaments, barely acute; immature seeds narrowly oblong to nearly linear.

SMELOWSKIA OVALIS. Mt. Adams, Washington, above snow line, August 12, 1892.

Type in the National Herbarium. I have forgotten the collector. With the habit of *S. calycina* but leaves coarser and thicker, floccose hoary throughout except the pods; pods about 1″ long and nearly as broad, a trifle narrowed at the apiculate apex, erect on pedicels about 3″ long; septum obovate, 1″ long; flowers small 1–1½″ long, white, petals spreading; style about ½ the length of *S. calycina*. This is very well marked by the short pod.

PHYSARIA DIDYMOCARPA var. NEWBERRYI (Gray, Bot. Ives, 6).

P. Newberryi l. c.

No. 5176g. May 5, Silver Reef, Utah, 4500° alt., in red sand, in dry and hot places.

No. 5464f. June 19, near Orangeville, Utah, in clay soil.

No. 5297b. May 26, Pahria Cañon, 5200° alt., in red sand.

No. 5312c. May 28, Cannonville, Utah, 6500° alt., in clay.

No. 5224a. May 15, Rockville, Utah, in red sand, 4000° alt.

No. 5163d. May 4, Silver Reef, Utah, in gravel, 4500° alt.

The only difference which I can see between this variety and the type is in the shorter style, which is generally shorter than the septum of the mature pod; the plant grows in a different zone, the type species being found among the junipers of the Great Basin region, and the variety occurring chiefly in the regions below the juniper belt as far down as the upper Larrea belt.

LEPIDIUM SCOPULORUM. *L. heterophyllum* (Watson, Am. Nat. 9, 268) Jones, Zoe, 4, 267.

The latter name is preoccupied. Dr. B. L. Robinson has called my attention to this and I have suggested this name in its place.

Lepidium integrifolium Nutt. *L. Utahense* Jones. Having an opportunity to compare my material with authentic specimens I find no appreciable difference.

Lepidium Oreganum Howell seems to be the same as *L. dictyotum*. His specimen examined is from Rogue River, Oregon, April.

Viola pinetorum Greene is only a coarsely toothed form of *V. aurea*, it has a long thick root, 6′ long. Some specimens of undoubted *V. aurea* without the other characters of *V. pinetorum* have coarsely toothed leaves.

Biscutella Californica is deliciously fragrant.

GREGGIA CAMPORUM var. LINEARIFOLIA (Watson, P. A. A. 18, 191). *G. linearifolia* Watson l. c.

CLEOME INTEGRIFOLIA var. ANGUSTA. No. 6057a.

Pods very narrowly-linear and cylindrical. This is the usual form indigenous to the West. Plants introduced from Mexico are like the typical form.

ARENARIA CONGESTA var. ACULEATA (Watson, Bot. King 40).

ARENARIA CONGESTA var. MACRADENIA (Watson, P. A. A. 17, 367, in part Robinson P. A. A. 29, 296).

The character of the sepals even in Parish's type specimen in the National Herbarium fails, for the sepals are oblong-ovate, barely acute, with many nerves, and are not more acute than Watson's type of *A. aculeata* in the National Herbarium. Watson's specimen has slender stems and knotty joints, while the more southern specimens in my collection do or do not have the joints conspicuous; the sharpness of the leaves varies greatly. There is no crucial character separating these three recognized species.

ARENARIA NUTTALLII var. GRACILIPES.

No. 5951. August 29, Brigham Peak, Utah, near Marysvale, 11,500° alt., in gravel, on exposed slopes above timber line.

No. 5770c. August 7, Fish Lake, Utah, 10,800° alt., on exposed ridges.

Sepals ovate to lanceolate, acute, sometimes slightly pungent, with narrow hyaline margin, midvein rather prominent, 1½″ long; leaves channeled as in the type, fasciculate, usually arched outward, blunt, or sometimes abruptly tipped with a short awn, 2–4″ long; stems many, very slender from the erect tap-root, sometimes 18′ long and filiform, making a loose mat on the ground; flowers widely spreading or reflexed; petals shorter than the sepals; leaves scarcely connate; pubescence variable but glandular-hairy throughout; the season's flowering stems usually 2–5′ long, rarely longer, spreading; bracts like the sepals and leaves, narrowly linear, thick. I also refer to this variety the following specimens in the National Herbarium: Cascade Mountains, Oregon, Howell;

Yellowstone Park, Tweedy; Mt. Adams, Washington, Howell; Yellowstone Park, Rose.

This grows in volcanic gravel above timber line, forming loose mats 7–15′ in diameter, and grows along with *Stellaria longipes* and *Phlox Douglasii*.

The variety *gracilis* Robinson, occupying the same zone as this variety, has slender-tipped, pungent leaves and bracts, and subulate-lanceolate sepals, with a very prominent midvein, which runs off into a sharp and rather long awn, the sepals being 2–2½″ long. This is Bolander's No. 4976. Coville and Funston's No. 1546 has little broader sepals and condensed habit, but the sepals, leaves and bracts are all pungent. Palmer's No. 195 seems to be about the same. All these are high altitude forms, growing in a very cold alpine zone, while the true *Nuttallii* grows in low, warm and arid altitudes, in a wholly different zone.

ARENARIA KINGII (Wats. King's Rep. 39, t. 6).

Stellaria Kingii Wats. l. c.

No. 5515. Manti, Utah, June 27, 6000° alt., in gravel, on dry slopes.

Having at last collected this species, it is manifest that it is a true *Arenaria* instead of a *Stellaria*, in spite of the bifid petals; in fact, it cannot be distinguished from the allied species of *Arenaria*, except by the petals. There is no *Stellaria* with which it has anything in common. It grows on gravely hills.

ACER GLABRUM var. TRIPARTITUM (Nutt. T. & G., Fl. 1, 247).

This would seem worthy of recognition as a variety. It is the usual Rocky Mountain form, with leaves 1–1½′ long, with three leaflets, or at least nearly parted, short racemes, 1–2′ long; wing of fruit 6″ long, and peduncles

scarcely ever shorter than the leaflets. The typical form occurs only northward from California to Idaho and Wyoming, with large simply lobed leaves, longer than the petiole; racemes 2–4′ long: fruit wings about 1′ long. The variety I have from as far north as Helena, Mont., Kelsey, where it is a curiosity. Also 5396, from Marysvale, Utah, in Bullion Cañon, 10,000° alt., along streams. June 5, 1895, grows in clumps, with reddish bark, seldom over 15° high. No. 5663g, Marvine laccolite, Henry Mountains, Utah, 6000° alt., in gravel, in box cañons.

LINUM KINGII var. PINETORUM.

No. 5306. May 28, 1894, cañon above Tropic, Utah, 6500° alt., in gravelly clay.

No. 6015g. September 6, 1894, Panguitch Lake, Utah, 8400° alt., in gravelly soil.

Low, 3–7′ high; much branched from the base, with very many erect, simple stems, or the outer ones decumbent at base; all the lower part of the stems densely clad with imbricated, 5-ranked, obtuse, glaucous, thick, oblong (to narrowly oblong above) leaves, 1–2″ long, or rarely longer; the upper leaves more distant and longer, but always longer than the internodes, rarely acute, 3–4″ long; flowers racemose or racemosely-clustered, rarely corymbose; sepals broad, barely acute or obtuse, rather broadly scarious and ciliate-dentate, 1-nerved, or with 1–2 very faint additional ones; petals yellow, obovate and rounded at apex, widely spreading, 3″ long. In other respects this agrees with the type of *L. Kingii*. It appears to be remarkably distinct and grows in a wholly different zone, at 8000 ft. alt., among the pines, in very porous volcanic soil. In view of the abnormal conditions under which it grows, it is probable that it is only a good variety, though the plant is remarkably abundant in the pine forests.

CEANOTHUS FENDLERI var. VIRIDIS.

No. 6039n. September 12, 1894, Elk Ranch, Utah, 7000° alt., in gravel.

No. 6042d. September 13, 1894, on grade below Carmel, Utah, 6500° alt., in gravel.

No. 5822h. August 10, 1894, Fish Lake, Utah, 10,000° alt., in gravel.

No. 5405f. June 6, 1894, Marysvale, at Jugtown, in gravel, 7000° alt.

No. 5312ao. May 29, 1894, head of cañon, above Tropic, 7000° alt., in clay.

No. 5308. May 28, at 6500° alt., same locality.

No. 5208b. May 11, 1894, Cedar City, Utah, 6000° alt., in gravel.

Whole plant glabrous throughout, or only minutely and sparsely pubescent along the veins of the leaves.

CEANOTHUS GREGGII var. LANUGINOSA.

This has more oblong leaves which are white-woolly below, and rather gray above. This is Pringle's No. 708, collected March 30, 1886, in the Santa Eulalia Mountains, Mexico. Also Palmer's plant from Coahuila, Mexico, both specimens in the National Herbarium.

PTELEA TRIFOLIATA var. ANGUSTIFOLIA (Benth. & Pl. Hartweg, 9).

No. 6048. September 15, 1894, Nagle's Ranch, Buckskin Mountains, Arizona, 7600° alt., in gravel.

After having examined a large suite of specimens from many localities, I find it is utterly impossible to keep up these two species, as there is no assigned character which holds, and I can discover no other valid one.

Trifolium Haydeni Porter Hayden's Rep. 1871. I think this is erroneously referred to *T. Kingii* by Coulter. The proper stems are only 1–2′ long; root leaflets round, to

broadly obovate, 3–4″ long, apiculate, very nervose, rather coarsely denticulate-serrate; stem leaves oval to elliptical and a trifle longer; peduncles 3–4′ long, terminal and single; whole plant glabrous and shining; flowers white, 6″ long, 2″ wide at apex, radiating in all directions, in a head, rachis not produced; calyx teeth as long as, or one-third longer, than the tube, subulate; tube ¾″ long; densely cæspitose and lower stipules imbricated; petioles 1–2′ long. Cook City, Montana, Kelsey, No. 345. Rose, N. W. Wyoming.

Trifolium gymnocarpum I cannot separate from *T. Plummeræ.*

Trifolium Harneyensis Howell I cannot separate from *T. eriocephalum.*

Lupinus Sileri Watson seems to me a good species. Specimens in the National Herbarium are Newberry in McComb's Exp., Ward, Utah; Capt. Bishop same. This is the same as *L. capitatus* Greene, Pitt. 1, 171. Other specimens are Knowlton, San Francisco Mountains, Arizona; Rusby, Cosnino, Arizona, which is in the same region.

LUPINUS MICENSIS.

No. 5064o. April 14, Mica Spring, Nevada, 4000° alt., in granitic gravel.

No. 5149h. May 3, Silver Reef, Utah, 3500° alt., on slopes in red stand.

No. 5163g. May 4, Silver Reef, Utah, 3500° alt., on slopes.

No. 5045f. April 13, Mica Spring, Nevada, 4000° alt., in granitic gravel.

No. 5095b. April 21, Pagumpa, Arizona, 4000° alt., in gravel.

No. 5072b. April 16, Mica Mine, Arizona, 4000° alt., in gravel.

No. 5176j. May 5, Silver Reef, Utah, 3500° alt., in gravel.

Allied to *L. brevicaulis;* annual, 2–6′ high, branching from the base and lateral stems decumbent; whole plant even to the calyx and pods sparsely long- and silky-villous, or in some cases quite densely so, the hairs always spreading and soft; petioles usually 3 to 4 times the leaflets; leaflets spatulate, 8″ long or less, and about 2½″ wide, rounded, often apiculate, about 8, not reduced above; whole plant very leafy; flowers 3½″ long, in short, spike-like racemes, reddish-purple, subtended by short, triangular bracts; calyx lobes lanceolate, 1½–2″ long and the calyx cleft nearly to the base, banner oval and shorter than the keel; keel 1½″ wide; pods narrowly-oblong, about 8″ long, 2½″ wide, deeply cross-wrinkled between the seeds: seeds 3–4, nearly square, about 1½″ wide. This differs from *L. brevicaulis* in the narrow pods, much larger flowers, in racemes instead of heads, and the caulescent stems. It seems to be intermediate between *L. brevicaulis* and *L. Arizonicus.* Having gathered it in very many localities and finding that its characters remain constant I do not hesitate to separate it as a good species.

This grows in the Larrea belt in red sand and on gravelly slopes.

Petalostemon flavescens Watson seems to be a white flowered form of *P. Searlsiæ.* I can see no other valid difference.

Psoralea castorea Watson.

No. 5024j. April 5, 1894. Beaverdam, Arizona, 1800° alt., in drifting sand.

This plant is found only within the Larrea belt on drifting sand dunes, growing singly, from a deep seated, erect, nearly spherical root which is fleshy and with only scattered woody fibers within; the root is 2′ or more in diameter.

Psoralea mephitica Wats.

No. 5082a. April 20, 1894, Pagumpa, Arizona, 4000° alt., in gravelly clay.

No. 5098b. April 23, 1894, top of grade above Pagumpa, Arizona, 5,000° alt., in gravelly clay.

No. 5095. April 21, 1894, Pagumpa, Arizona, 4000° alt., in gravelly clay.

This is the plant referred to by me in my Contributions in Zoe as *P. castorea*. An examination of duplicate type specimens of the latter species shows that Watson was mistaken in both his description of the latter species and in the locality at which it was collected. Watson mistook the bracts for the calyx lobes, and gave as the locality where the plants were collected "Beaver City, Utah," adding (doubtless on the authority of Dr. Palmer) the statement that both species grew together. This is erroneous. Dr. Palmer never collected any plants at Beaver City, Utah, during the year in which he collected these species, but he did collect in that year in the Beaverdam Mountains on the northeastern corner of Arizona at a place called Beaverdam. On the drifting sand dunes at Beaverdam Dr. Palmer collected *P. castorea* probably at the end of his day's journey, that being the first place in which water can be secured west of the Beaverdam Mountains, and therefore must have been his camping place for the night. During the earlier part of the same day along the road he must have collected *P. mephitica* among the junipers high up on the mountains in a wholly different zone from that of the *Larrea* belt in which the former was collected. The difference in elevation at which the two species grow is over 3000 ft. *P. mephitica* never grows in loose sand but always on rocky or gravelly places and is remarkable for its long, tuberous-thickened, branched, woods, and interlaced roots, forming broad patches among the junipers.

HOSACKIA RIGIDA var. NUMMULARIA.

No. 5224k. May 15, 1894, Rockville, Utah, 4000° alt., in red sand.

No. 5125d. April 28, 1894, Diamond valley, Utah, 4000° alt., in red sand.

No. 5098d. April 23, 1894, 10 miles south of Black Rock Spring, Arizona, 4500° alt., in gravel, among junipers.

No. 5128. April 30, 1894, Santa Clara valley, Utah, 3000° alt., in gravel, along the river bed.

Herbaceous throughout, prostrate, lower leaflets round, all the leaves except the very uppermost short-petioled, whole plant ashy, root woody, stems 1–2½° long, forming loose mats and decumbent or procumbent.

This abounds in sandy or gravelly places, mostly along the streams. To this I also refer Wright's No. 1357, Palmer's specimen from Fort Huachuca, Arizona, both being pubescent; also a specimen of the Mexican Boundary Survey, a specimen from Parish collected at Lowell, Arizona, Rusby's specimen from the San Francisco Mountains, Arizona, collected in April, and a specimen from western Texas by Neally, all in the National Herbarium.

Phaca L. Among the genera recently revived for American plants there is none which deserves so little attention as this; but this genus is revived, apparently, in order to avoid the odium attaching to relegating so large and common a genus as *Astragalus* to synonymy because of priority by position. It is curious to see the twins *Phaca bisulcata* and *Astragalus scobinatulus* in separate genera: also *Astragalus Shortianus* and *Phaca pectinata*, while *Astragalus racemosus*, *oroboides* and *gracilis*, with strictly one cell, are relegated to *Astragalus*, and *A. aboriginum*, *alpinus*, *Robbinsii*, with rudiments of a septum, are also retained. It would be interesting to see what kind

of a generic character the authors of the "Check List" would make for *Phaca*.

ASTRAGALUS ANGUSTUS.

Astragalus pictus Gray, var. *angustus* Jones, Zoe, 4. 37.

Mr. Sheldon, in making a new name for the type species. refers my var. *angustus* to it under the name of var. *Jonesii* without previously consulting me as to the desirability my accepting the high honor of having a variety dedicated to me which in the very nature of the case could never be more than a synonym. Mr. Sheldon makes the name to supplant *angustus*, because, as he assumes, it was used previously by Boissier, but Boissier never made the name *Astragalus angustus*, as far as I know. In his second attempt at correcting names, Mr. Sheldon, departing from his uniform rule of giving specific names to varieties and mere forms, reduces (without having seen my type) my var. to a synonym of the var. *foliolosus* Gray, raising that form to a species, stating that its synonyms are "*A. pictus* var. *angustatus* Jones, not *A. angustatus* Boissier, *A. ceramicus* var. *Jonesii* Sheldon." Now, I never published any *Astragalus angustatus*, and it appears that Boissier never published an *Astragalus angustus*. Hence the resulting batch of synonyms is wholly useless. Curiously enough, *Astragalus pictus* var. *angustus* differs from the type and from the vars. *foliolosus* and *filifolius* more than they do from each other, and under the methods so common in closet botanizing would be called a good species.

The same method of making useless synonyms was employed in renaming *Astragalus strigosus* Coulter & Fisher (*A. griscopubens* Sheldon), Mr. Sheldon being wholly unaware that that name is a synonym for *Astragalus serotinus* Gray.

The synonym of this species and its varieties, on the basis recommended by the recent circular of representative American botanists is as follows:

ASTRALAGUS ANGUSTUS.

Astragalus pictus var. *angustus* Jones, Zoe, 4, 37, 1893.

Astragalus ceramicus var. *Jonesii* Sheldon, Bull. Minn. Geol. and Nat. Hist. Surv., 9, 19, 1894.

A. pictus var. *foliolosus* Sheldon, l. c. 9, 138, 1894.

Not *A. pictus* var. *foliolosus* Gray.

ASTRAGALUS ANGUSTUS var. PICTUS (Gray, Pl. Fend. 37).

Phaca picta Gray, Pl. Fend. 37, 1849.

Astragalus pictus Gray, P. A. A. 6, 214, 1866.

Tragacantha picta O. K. Rev. Gen. Pl. 2, 947, 1891.

Not *Astragalus pictus* Steud. Nom. Ed. 2 1, 163, 1840.

Astragalus ceramicus Sheldon, l. c. 9, 19, 1894.

Astragalus pictus var. *foliolosus* Gray, P. A. A. 6, 215, 1866.

An examination of the type of this variety in the National Herbarium shows that it differs from the typical species in no respect worthy of varietal rank.

Astragalus foliolosus Sheldon, l. c. 9, 138, 1894.

Not *Astragalus foliolosus* Bunge, Gen. Astrag. Geront. 2, 125, 1886; a recognized species.

ASTRAGALUS ANGUSTUS var. LONGIFOLIUS (Pursh, Fl. A. Sept. 2, 741, 1814.

Psoralea longifolia Pursh, l. c.

Orobus longifolius Nutt. T. & G. Fl. 1, 346, 1838.

Not *Astragalus longifolius* Lam. Ency. Meth. 1, 322, 1783.

Astragalus filifolius Gray, Pac. R. R. Rep. 12, 42, 1860.

Astragalus pictus var. *filifolius* Gray, P. A. A. 6, 214, 1866.

Not *Astragalus filifolius* Clos, C. Gay, Fl. Chil. 2, 111, 1846.

Astragalus ceramicus var. *imperfectus* Sheldon, l. c. 9, 19, 1894. All the above belong to *A. angustus*.

Astragalus subcinereus Gray. An examination of a duplicate type specimen of *Astragalus Wootoni* Sheldon shows that it is the same, the pods varying from deeply mottled to uncolored.

Astragalus acerbus Sheldon seems to be identical with *A. Dodgianus* Jones, and the latter is not surely separable from *A. Wingatensis* Watson.

Astragalus recurvus Greene proves to be the same as *A. lanceareus* Gray, and not *A. obscurus*, as I had supposed, the original type specimen being very poor and in fruit only. My specimen "with crimped edges to the pod" barely in fruit is this species.

Astragalus Pattersoni Gray. An examination of the type of *Astragalus diphysus* var. *albiflorus* Gray, Bot. Ives, shows that it is identical with *A. Pattersoni*. Now, here is a chance to immortalize oneself by making a brand new name for this nauseous and poisonous weed, on the once-a-synonym-always-a-synonym system.

ASTRAGALUS PATTERSONI var. PROCERUS (Gray, P. A. A. 13, 369, 1878).

Astragalus procerus Gray, l. c.

Astragalus prælongus Sheldon, l. c. 9, 19, 1894.

Since this is only a large flowered form with unusually broad pods, but which vary into the typical species, and since there is no reason for not using Gray's original name, which as a variety is unused, I place it as above.

Astragalus cerussatus Sheldon. This species I think should stand, as it is not the *Astragalus triflorus* Gray, Pl. Wright 2, 45, 1853, though it may be proved to vary into it, and therefore may have to be reduced to a variety

of it. It is the *Astragalus triflorus* of Watson in King's Rep., at least in part, of Coulter's Manual, and of most western collectors, and it may prove to be only an extreme form of *A. Wetherilli* Jones, in which case the latter name will prevail, but at present it seems sufficiently distinct. It seems to be confined to the mountainous regions of Colorado and adjacent States and Territories. It blooms throughout the season, often in bloom quite late.

Astragalus triflorus Gray, l. c. This seems to be close to *A. Candolleanus* (H. B. K.) Sheldon, and being the first name in the genus, should stand. It is not at all certain that it is distinct from *Phaca triflora* DC. Ast. 62, t. 1, 1802. It seems to be a very variable species. The typical form is annual, with the habit of *A. Geyeri* Gray, and seems to be an early bloomer. Specimens belonging here are C. Wright, New Mexico, the smallest specimen on the sheet from the Mexican Boundary Survey; one sheet of Dr. Mearns, Carrigallilo Mountains, New Mexico, April 18, 1892. A taller form (which may be *A. cerussatus* Sheldon) from El Paso, Texas, G. R. Vasey, is apparently perennial, and has purple flowers.

The various forms of this species which may deserve varietal rank are A. TRIFLORUS var. CANDOLLEANUS (H. B. K. Nov. Gen. et Sp. 6; 495. 1823), with oblique pods and many leaflets (usually 8 to 15 pairs).

A. TRIFLORUS var. INSULARIS (Kellogg, Bull. Cal. Acad. Sci. 1; 6. 1884), with few leaflets and scarcely oblique small pods. It is quite possible that this will still hold as a good species.

Astragalus Pondii Greene is close to the two above varieties and may deserve specific rank. It was poorly described, but authentic specimens show differences. It is the second specimen on the sheet in Cal. Acad. Sci. along with *A. insularis*, described by me in Contributions 4, p. 28, last form described.

Astragalus triflorus Sheldon (not DC.), Death Valley Rep., is *A. Tejouensis* or near it.

ASTRAGALUS HOLOSERICEUS. Between King City and Jolon, Monterey County, California. Miss Eastwood, June 7, 1893.

This is probably a variety of *A. cerussatus* or *A. triflorus*, but until the limits of those species are clearly made out this must stand, for there are no transitions yet known. Perennial seemingly, short-shaggy throughout but the stems and mature pods less so, hairs white, fixed by the base, spreading, tangled; stems a little flexuous, 1–2° high, with nodes 1–2′ apart, barely striate, ascending, unbranched; lower leaves small, 2–3′ long, with 5–7 pairs of elliptical and acute leaflets 3″ long, and petioles equaling the rachis; stipules subulate with short filiform tip, 3″ long, reflexed, thick, adnate, not connate; upper leaves 4–6′ long, with short petiole 1′ long or less, leaflets about 10 pairs, linear-lanceolate, very acute, 6–8″ long; flowers nearly white, 3″ long, on stout pedicels 1½″ long which are twice the ovate and minute bract, in a short close raceme 1–2′ long; peduncles and rachis about 4–6′ long, rather stout; calyx tube campanulate, 1½″ long and nearly as wide, with subulate to triangular teeth nearly as long and curved; banner short and rounded, blade 2″ long, arched in short curve to 90° just beyond calyx tube, erect part less than 1″ high, sides reflexed a little; wings narrowly oblong, arched to 45° or less, a trifle longer than keel and but little shorter than the banner, narrower than the keel; keel a little arched below, rather abruptly bent at apex to 90° and vertical portion with straight edge, the very tip a little recurved so as to make a short boss, erect part as long as base and 1½″ high, a trifle longer than the calyx teeth; pods oval 1′ long, 9″ wide, ventral suture less

arched than the dorsal and a trifle sulcate at times, otherwise cross-section round, chartaceous, much inflated, jointed at base but sessile or with stipe shorter than broad, 1-celled, reflexed or spreading; flowers ascending.

Astragalus debilis (Nutt.) Gray. Mr. Sheldon seems to have renamed this species under the name of *A. Bodini*, without noticing their similarity. Having seen a duplicate type specimen I discover that Mr. Sheldon's description is very inaccurate. He says pod "flat"; "species nearest to *Astragalus tenellus* Pursh, but the habit is more nearly that of *Astragalus flexuosus* Douglas." In fact the specimens on which Mr. Sheldon bases his species are so near to *A. leptaleus* that it is very difficult to separate them. The species has no relation to the *Homalobi*. The pods are triangular or nearly round in cross-section. Below I append a description from my field notes of the same species. Ward also collected it long ago in the same locality as mine and distributed it as *A. oroboides*.

ASTRAGALUS DEBILIS (Nutt.) Gray.

No. 5649. Loa, Utah, 7000° alt., in clayey meadows, July 18, 1894.

No. 5709b. August 1, 1894, same locality.

Prostrate, in open mats, often 3° in diameter, from an erect and woody root; stems very slender; stipules large, foliaceous, triangular, mostly reflexed, 4″ long, 2″ wide; leaflets oval to lanceolate, acute; peduncles slender, 2–4′ long, surpassing the leaves, capitately flowered and spicate in fruit, but spike short; pedicel short, stout and black, ½″ long; bracts green, lanceolate, 1½″ long; flowers 3–4″ long, light purple, numerous, spreading, the pedicel inclined to be twisted in fruit; calyx tube 1½″ long, almost cylindrical, but a little compressed below and obcompressed above on the deeper cleft upper side, hyaline, nigrescent with short,

black and appressed hairs, lower side straight, upper side a trifle convex, neither oblique nor obliquely attached; calyx teeth equal, about 1″ long, subulate; sinuses except the rounded upper one acute; banner oval to oblong-oval, ascending abruptly at calyx tips to 45°, sides reflexed at point opposite the keel, ¼″ wide, not at all at apex, which is emarginate and rounded, erect part of banner 2″ long, sulcus reduced to a groove above but semicircular below keel tip and ⅓″ wide, white spot comes to within ⅓″ of the sides and ½″ of the tip, obovate to fan-shaped, and lacerate above by the intruding purple veins, which are very fine, and unite below in twos, but do not form a ring, white spot 1″ wide and 1⅓″ long, all of the banner is veined with dark purple; blade of the wings 1½″ long, sometimes 1″ wide, obliquely oblong, with narrowed tip, but obtuse, left hand one spreading and concave to the keel, and turned nearly horizontal, with the concave side down, right hand one incurved over the keel tip and ½″ longer, light purple and with purple veins near the lower side, keel much inflated near the calyx tips, but flat beyond and ½″ longer, incurved to 100°, very obtuse, dark purple; pods triquetrous, 1″ thick, oblong, 4″ long, acute at each end, on a stipe ¼″ long, which is as thick as long or nearly so, spreading, minutely pubescent, double the calyx tube, which it splits as it matures.

Astragalus Tolucanus Robinson & Seaton. Pringle, No. 4238, on dry ridges under pines, Nevada de Toluca, Mexico, 12,000° alt., September 6, 1892. With the inflorescence of *A. agrestis* and the pods of *A. aboriginum* nearly. Perennial, with many delicate, decumbent stems from an erect root, 6′ long or less; leaves 2–3′ long, delicate, thin, with very short petiole; leaflets 10–12 pairs, 2–3″ long, 1–1½″ wide, elliptical, obtuse, glabrous above, puberulent below; root leaves smaller; lower stipules

small, upper enlarging, all connate opposite the petioles, lanceolate, acute, uppermost 3″ long, somewhat hyaline; nodes 1′ apart; peduncles at least equaling the leaves, fully as thick as the stems, erect or ascending, sulcate; flowers capitate, about 20, 6″ long, spreading, purple, on pedicels, 1″ long; bracts large, oval to obovate, green, nigrescent, 2″ long; calyx tube campanulate, 1½″ long, 1″ wide, green, with broad triangular green lobes nearly as long; banner obovate to oblong, blade 3″ long, ascending 45° in a gentle curve from calyx tips, sides reflexed ⅓″ wide; wings 1″ wide, narrowly oblong, ascending, concealing keel, ¾″ shorter than banner, fully 1″ longer than keel; keel a little downwardly arched, bent at tip abruptly to 90° and vertical edge straight, 1½″ high, acutish, purple tipped, veined; pod membranous, 1-celled, 6″ long, 2″ wide, elliptical, apiculate, round in cross-section apparently, not sulcate, stipitate on stipe as long as calyx tube, pendent, smooth, seed bearing throughout. Manifestly closely allied to *A. aboriginum*. Described from duplicate type in National Herbarium.

ASTRAGALUS SERPENS.

No. 5639i. July 17, 1894, Loa Pass, Utah, 7500° alt., in gravel, among sagebrush.

Perennial, from a thick, erect, woody, much-branched root, whose stems for several inches in length endure over winter and are covered with dead leaf-petioles and even leaves and peduncles; stems prostrate at base, ascending at tip, 2–10′ long, in rather dense tufts, much branched below, leaves reduced above and also below, all petioled, petioles nearly equaling the rachis, the whole being seldom over 1½′ long; leaflets about 6 pairs, elliptical and folded, 2–3″ long; whole plant finely pubescent with appressed hairs fixed at the base; nodes very short, 6″ long or less; peduncles 1½′ long or less; flowers 2–5 on stout

pedicels; pedicels 1″ long, much longer than the ovate bract, reflexed or spreading, 3″ long; calyx tube broadly campanulate, 1″ long, with triangular teeth half as long; banner nearly round, blade 1½″ long and wide, with sides a little reflexed, just equaling the wings and keel, arched abruptly to 110° at calyx tips, white spot large and purple-veined, flowers greenish-purple: wings obovate-oval, very oblique, 1½″ wide, nearly 2″ long, just the shape of the keel; keel blunt, a trifle arched below and tip incurved 90°, with a minute boss at tip, keel about 1½″ high; pods 1-celled, oval-ovate to half-oval, 1½″–3″ long, cross-section triangular to roundish, pod barely sulcate ventrally, thin-papery, acutish, rounded at base and very shortly stipitate (stipe half the calyx tube), purple-spotted; seeds oblong, on stalk ½″ long; ventral suture seed-bearing only in the middle. The stipules are triangular, small and seemingly free.

ASTRAGALUS SILERANUS var. CARIACUS.

No. 6036. September 12, 1894, Elk Ranch, Utah, 7000° alt., in gravel.

No. 6033f. September 11, 1894, 4 miles below Ranch Utah, 7400° alt., in gravel.

This plant differs from the type in having pods which are 1½′ long or less, variously acuminate-pointed and often much contracted at the base; the leaflets are elliptical-oblong, 4″ long or very much less on the same plant, with a petiole often 1½″ long; the stipules are rather rigid, green, reflexed, triangular or with a triangular base and the upper ones with a long subulate apex; the plants are often 3° long and either flat on the ground or (as in the type) ascending among the bushes; the pods are from narrowly-oblong to oval and often with an upcurved apex and a downwardly-curved base in the forms with longer pods.

ASTRAGALUS MEGACARPUS var. CAULESCENS.

No. 5639f. July 17, 1894, Loa Pass, Utah, 8000° alt., in gravel under sagebrush.

This has large leaves, 6′ long, stems a foot high, with large, green triangular stipules 2–3″ long and stipe as long as the calyx.

The variety *Parryi* Gray has elliptical leaflets and pods 1½′ long on a stipe ½″ long. What appears to be nearly the same, from Peach Springs, Arizona, by Lemmon, has a stipe as long as the calyx, and teeth, and stems from 4–6′ long; the pod is as described above, but elliptical-oval. It is quite probable that both varieties will prove to be only forms not deserving varietal rank.

ASTRAGALUS STRIATIFLORUS.

No. 6080k. September 25, 1894, above Springdale, Utah, 4000° alt., in red sand.

Perennial from an erect root; stems prostrate, 2–6′ long, herbaceous; nodes 6″ long or less; stipules hyaline, light chestnut colored, connate and cup-like, 2″ high, a little pointed; whole plant densely appressed-hairy with rather long slender hairs fixed by the base, and stems short-shaggy with white hairs; leaves on slender petioles which are a trifle longer than the rachis, leaves 2′ long; leaflets contiguous, 4–6 pairs, orbicular, folded, 2″ long; peduncles slender, bearing few subcapitate flowers at the apex, 2½–5′ long; pedicels ½″ long, shorter than the ovate bracts; calyx tube campanulate, 1–1½″ long, 1″ wide; triangular teeth a little shorter; flowers about 4″ long, banner greenish white, purple below and purple veined, oval, the blade 2″ long, its sides reflexed a little, arched abruptly at tip of calyx tube to 90°; wings oblong, equaling the keel, ½″ wide, arched: keel ½″ wide at base and with the apex produced gradually into a long, narrow, nearly erect sharp tip; ovary

linear; fruit not seen, but certainly belonging to the *Inflati* and probably near to *A. serpens*. Ordinarily I should not think of describing an *Astragalus* without the pods, but this is so distinct in its characters that I venture to publish it.

This grows in sandy soil on gravelly slopes.

ASTRAGALUS TEJONENSIS. Allied to *A. oocarpus*.

Pringle, Mojave desert, May 13, 1882, on hills bordering the desert. Tehachapi, Cal., June, 1884, hills near Tejon Pass, Cal., May 13, 1882. This seems like a hybrid between *Parishii* and *allochrous*, but cannot be, as *allochrous* does not grow there; the only possible parents are *Parishii* and *Douglasii*. Green throughout, but on close inspection there is the same ashy pubescence as of the allied species, which is composed of flattish, narrow, short hairs, fixed by the base and closely appressed; leaflets and leaves as in *A. Parishii*, but leaves 3–5′ long and ascending, and leaflets 10 pairs, 1′ long or less, elliptical to oblong lanceolate, rounded at apex, 2–2½″ wide: proper petiole present in all; peduncles and rachis 5–8′ long, finely sulcate as well as the stems; flowers racemose, usually ascending, often distant, inflorescence 2–3′ long in flower and 4–6′ long in fruit; pods ascending usually, half ovate-oval, ventral suture straight, 1–1½′ long, ¾ to 1′ wide, nearly round, sessile, variously reticulated, nearly glabrous when ripe; flowers like *A. Parishii* but banner not elongated; keel tip but little incurved and broader; calyx lobes subulate and half the tube; decumbent, many stemmed. *A. Parishii* seems to have longer nodes, narrower leaflets, and is more open and erect. This is instantly recognized from allied species by its small yellow flowers, long calyx lobes, broad leaflets and green appearance. Specimens from Palmer from Edgewood, Cal., July, 1892, have pods 1′ long,

emarginate leaflets, but otherwise the same. Type in National Herbarium.

To this species I refer with much doubt Palmer's specimen from Lagoon Head, Lower California, March 6–15, 1889. Stems erect; petioles absent; leaves and the stiff long peduncles ascending; whole plant nearly glabrous; stipules minute, adnate, not connate; spikes 2–4′ long; peduncles floriferous on the upper third; flowers loosely spicate-racemose, almost sessile, the pedicels being half the short ovate bracts; calyx broadly campanulate, tube 1″ long and wide, triangular teeth half as long; flowers 4″ long, purple; keel large, blade 3″ long, erect portion as long as the horizontal part and bent to it at an angle of 90°; banner ascending sharply to 45° and remote from calyx lobes, sides reflexed; wings 3″ long, lanceolate, arched 30°, a trifle longer than the keel which is fully 1″ shorter than the banner; pods obliquely ovate-oblong, 9″ long, 6″ wide, sessile, rounded at base, papery, sulcate ventrally, shortly acute, circular in cross-section, nearly smooth, ascending. Should this prove to be a new species, as it is most likely to be, it may be called *Astragalus piscinus*.

Astragalus Douglasii var. glaberrimus. Los Huevelos, Lower California, 1889, Brandegee; also at San Fernando. Plants 1–1½° high, rather bushy, branched at base, perennial, whole plant glabrous; leaflets about 7 pairs, linear-lanceolate and very sharp, 6–8″ long and 1″ wide, distant, all but the very uppermost petioled; racemes very lax, 4–5′ long including the rachis, floriferous on the upper two-thirds; flowers 6–10; pods half-oval, shortly-flat-triangular beaked, 1–1½′ long, round in cross-section, deflexed; otherwise as in *A. Douglasii*. Type in the California Academy Herbarium.

Astragalus Haydenianus Gray. From a large amount

of material now on hand, it appears that *A. grallator* Watson is only an abnormal form, due either to insects or some fungoid agency. The normal young pods are vetch-like, and with age become greatly obcompressed. The corrugations are due in their intensity or faintness to moisture and shade, or the opposite. I find that these two causes, which are purely accidental, produce all the forms hitherto separated as species and varieties, and so have no distributional significance. The synonyms are: *A. Haydenianus* vars. *major* and *Nevadensis* Jones, *A. scobinatulus* Sheldon, *A. demissus* Greene, *A. Jepsoni* Sheldon, and *A. grallator* Watson.

Astragalus nitidus Douglas, Herb. Hort. Soc. Hooker, Fl. 1, 149. A careful examination of all the figures and descriptions of *A. adsurgens* Pall. and *A. Laxmanni* Jacq., together with specimens of Maximowics from Japan, lead me to feel quite certain that our plant is distinct from both of them, and is the same as *A. striatus* Nutt. T. & G., Fl. 1, 330.

Astragalus agrestis Douglas, Hook., Fl. 1, 148. This has been erroneously referred to *A. hypoglottis* L. Our species has oblong to linear green bracts, which are very conspicuous, obtuse at the base of the head of flowers, and acute toward the top of the head, often with a hyaline margin, about equaling the calyx tube; calyx cylindric, teeth linear-subulate, 1″ long; banner obovate, 6″ long, slightly ascending (15°), sides reflexed more or less; wings linear, nearly as long as the banner, which is 2″ longer than the keel; banner arched from a point beyond the calyx tips; pods very deeply sulcate, often almost to ventral suture, and septum narrow, usually white-woolly, oval to oblong, splitting the calyx, shortly stipitate; leaves narrowly elliptical, never acute, usually emarginate when mature; stipules long-sheathing opposite the petioles,

green at least at tip, blunt, or rarely acute, often 6″ long, and resembling the bracts; pedicels about ¾″ long. Throughout the Great Plateau, in subalpine meadows, or even as low as 6000° alt., in meadows. Apparently from Bolivia, Rusby, but specimens more like those of Europe. *Astragalus virgultulus* Sheldon is the same as *A. agrestis* apparently.

Astragalus hypoglottis L. as figured in Pall. Astrag. has subulate pointed bracts; campanulate calyx, teeth subulate and shorter than the short tube; banner short and oval; wings oblong and barely longer than the keel; leaflets lanceolate and always acute; stipules much smaller, bracts ovate to linear-lanceolate; calyx lobes less than half the tube; pods with longer stipe and broader, ovate, very blunt at both ends; plants sparsely hairy with long slender hairs (ours are usually nearly glabrous); pods simply hairy; leaflets about 8 pairs; peduncles longer than the leaves.

ASTRAGALUS CANADENSIS L. var. CAROLINIANUS (L).

This seems to be a very good geographical variety, abounding from North Carolina to the Ohio River, and rarely beyond. This has long open spikes of small, not greenish nor thick flowers: oblong-oval, apiculate, 2-celled pods, 4″ long.

Astragalus simplicifolius (Nutt. T. & G., Fl. 1, 350, 1838) Gray. It is manifest that this is a reduced form of what has heretofore been called *Astragalus cæspitosus*.

ASTRAGALUS SIMPLICIFOLIUS var. CÆSPITOSUS (Nutt. T. & G., Fl. 1, 352).

To this must be referred the very common and normal form of the species. The synonymy is *A. cæspitosus* (Nutt.) Gray, P. A. A. 6, 230; *Tragacantha cæspitosa* OK. Rev. Gen. Pl. 2, 943: *Homalobus canescens* Nutt. T. & G., Fl. 1. 352: *Homalobus brachycarpus* Nutt. l. c.;

A. spatulatus Sheldon, l. c. 9, 19; *A. lingulatus* Sheldon, l. c. 9, 118. The last seems to be identical with *Homalobus canescens* Nutt. This species is quite variable.

ASTRAGALUS HYALINUS. Nearest to *A. triphyllus* Pursh.

Stems loosely matted, usually erect, 1 to 2′ high, at the ends of the much branched thick root; stipules very conspicuous, large, much imbricated, at least 9″ long, smooth except at the very base, where there is a tuft of long, straight, white hairs; leaflets narrowly elliptical to oblanceolate, about 6″ long and 2″ wide, obtuse or barely acute, 3, densely silky all over, with hairs attached by the middle, on a varying petiole; flowers, one or two in a place, sessile at the base of the leaf, apparently white with a dark keel tip; calyx very white-villous, cylindrical, 6″ long, 1½″ wide, little exceeding the stipules, teeth subulate, 1″ long; corolla very pubescent outside, banner oblanceolate, emarginate, about 1′ long and 1½″ wide, proper blade 3″ long; wings narrowly linear and as long as the banner; keel 3″ shorter than the wings, very narrow, apex but little arched; fruit immature but manifestly sessile, very white-silky, ovate or triangular, round in cross-section, 3″ long. At first I took this to be an abnormal form of *A. triphyllus*, due to a fungus, but careful examination failed to show any fungus growth, while some specimens showed normal vigorous pods. This differs from *A. triphyllus* in the pubescent corolla, broader leaflets, stems, and the very conspicuous stipules. *A. triphyllus* is densely congested, like *Krynitzkia arctioides*. Upper Lawrence Fork, Kimball County, Nebraska, No. 80; Cliffs, Banner County, Nebraska, August, 1890; Hills, Kiowa valley, Scott's Bluff County, Nebraska; all collected by Rydberg. Type in University of Nebraska and duplicate types in National Herbarium.

Astragalus Californicus (Gray) Greene seems to me to be a good species, the distinguishing characters being the more numerous leaflets, the long, tapering, mottled pods, and the shorter calyx. More abundant material might, however, prove these characters to be invalid, but so far they are good.

Astragalus Tweedyi Canby seems to be very distinct, but close to *A. collinus*. Calyx ascending; pods 1-celled, erect, on a stout stipe, which is ½ longer than the calyx, with the shape of *A. arrectus*, nearly cylindrical, shortly acute at both ends, nearly straight, 6 to 8″ long, 1½″ wide, about 1″ thick; cartilaginous, and like all the rest of its group, filled with pulp; leaflets fully linear, blunt, 6–8 pairs, 1″ wide, 1′ long, rather distant, almost no proper petiole; stipules very small; plants erect, 2° high; peduncles strict, 6–12′ long, sulcate; whole plant finely pubescent, with slender hairs fixed by the base.

These notes taken from a duplicate type.

ASTRAGALIS HUMISTRATUS var. TENERRIMUS.

No. 6052f. September 17, 1894, Buckskin Mountains, Arizona, 9000° alt., in gravel, under conifers.

No. 6064. September 20, 1894, road to Nagle's Ranch, Buckskin Mountains, Arizona, 9000° alt., in gravel.

No. 6056bm. Same locality and date.

This variety is characterized by having very many slender stems lying perfectly flat on the ground and covered with soil towards the base, the whole forming a mat from 1½–3° in diameter; the leaflets are mostly in 4–6 pairs, ovate to obovate and rounded, 1½″ or less long and nearly glabrous; the flowers are very few, in a loose, short raceme, nearly white, with filiform calyx lobes longer than the tube, and the pods of *A. Sonoræ* Gray (which is only a form of *humistratus*).

ASTRAGALUS TEGETARIUS var. ROTUNDUS.

No. 5649b. July 18. 1894. Loa, Utah. 7000° alt.. in clay.

No. 6002. September 6. 1894, Panguitch Lake, Utah. 8400° alt., in gravel.

This has the habit of *Astragalus tegetarius*, but the leaves are stiffer and more pungent, much after the fashion of *A. Kentrophyta*, but lies strictly flat on the ground: the pods are generally not in the least flattened, oval-ovate and usually straight, though the immature pods are occasionally flattish and sometimes a little curved.

Astragalus tegetarius var. *implexus* Canby does not seem to be worthy of varietal rank as it is only a condensed form.

This species is very close to *A. Kentrophyta*, but the habitat is very different, most of the differences in appearance can be explained by the different habitat.

Astragalus Kentrophyta var. *ungulatus*. This is the white hoary plant with lanceolate, curved and acuminate-tipped pods with round cross-section, represented by Watson's specimen in the National Herbarium from Monitor valley, Nevada, and by mine from Sprucemont, Nevada.

ASTRAGALUS CYMBOIDES.

No. 5658q. July 21, 1894, Cottrell's Ranch, Henry Mountains, Utah, 6000° alt,, in gravel.

No. 5464j. June 19, 1894, Huntington, Utah, in clay. 5000° alt.

No. 5445f. June 16, 1894, near Emery, Utah, 7000° alt., in clay.

Perennial, flat and matted on the ground; peduncle shorter than the leaves in flower; stipules triangular, rather large, adnate, not connate, rather longer than the very short nodes, densely appressed-strigose and thus giving the stems a shaggy appearance; leaflets 4–5 pairs,

elliptical, obtuse, usually about 3″ long, finely appressed-pubescent, with hairs fixed by the middle; petioles longer than the rachis, 2½–5′ long; pods prostrate, oblong-ovate, cross-section almost round, 3″ wide and 8″ long, apiculate, straight, very fleshy, inner wall woody, the outer composed of a pulp over ½″ thick which at the ventral suture is 1″ thick, the ripe pods when dry have a thickened and raised ventral and dorsal suture, the latter the smaller, the general appearance of the pod being that of *A. Missouriensis*, the middle of the pod is swelled longitudinally so much so that the pod seems to be 4-sided, but the two sides are always rounded and not acute as they are at the sutures, pods reddish; seeds many, filling the hairy cavity, long stalked; calyx laterally flattened and much deeper cleft above; teeth unequal; banner white, bent rather abruptly at a point ½″ beyond the calyx tips to 45° and arched above, oblong-oval, sides reflexed at the keel 1″ deep, and banner usually fiddle-shaped by the sides not being reflexed above and below, notched ½″ deep; sulcus decidedly narrowed below and nearly V-shaped, 1″ deep, ½″ wide; above it is 1″ wide and U-shaped and vanishes about 1″ below the tip of the banner; banner water-lined; wings linear-oblong, arched a trifle, notched below the apex, as wide at the blunt apex as below, close-pressed and convex to the keel to a point ½″ below the tip of the keel, then spreading and tips horizontal and incurved and often touching each other, the concave side is downwards, pink-purple and streaked with darker color, ½″ wide; keel blunt and rounded at the apex to 95°, purple-tipped, 1″ high and nearly as much shorter than the wings; calyx tube ½″ thick, 1″ wide and 3″ long, the upper side a little convex, lower straight, oblique at base and a little thickened there; pedicels very short and as long as the bracts; the stems are usually 2–6′ long.

This grows in clayey and rather alkaline soil in desert places, and always seems to have white flowers; the pods frequently have the papery surface split away from the woody inner wall, especially at the sutures after the fashion of *A. cicadæ*.

ASTRAGALUS ZIONIS.

No. 5261w. May 17, 1894, Springdale, Utah, 4000° alt., in red sand.

No. 5249h. May 16, same locality.

No. 5224d. May 15, 1894, Rockville, Utah, in red sand, 4000° alt.

No. 5001b. March 30, 1894, Bellevue, Utah, in red sand at 3600° alt.

No. 5239. May 16, 1894, Springdale, Utah, 4000° alt., in red sand.

No. 5249g. Same date and locality.

This is a tufted perennial with the habit of *A. amphioxys*, but more slender, while the spreading, rather longer pubescence of very delicate hairs is fixed by the base and not by the middle as in that species; stipules very broad, 1–2″ long, adnate to the petiole but free from each other, hyaline below; stems densely tufted from a deep, perennial, erect root, wholly herbaceous, with nodes 3′ long or less, ascending; leaves 5–12′ long, with petiole about ⅓ the length and slender; leaflets about 10 pairs, ovate to lanceolate, 6″ long, very acute, not contiguous; peduncles about as long as the leaves, and the rachis ¼ as long as the peduncle; pods ascending, arcuate, abruptly long-acute, with flat subulate style, linear-oblong, 2″ wide and about 1¼′ long, a trifle sulcate and rather triangular in cross-section, at least when dry, but when fresh much rounded, ventral suture not raised but pod much flattened on each side of it, narrow below, sessile, with a complete joint at base, short-shaggy, mottled, pubescence very

fine and soft, rarely the pods are obcompressed when much arcuate so as to be linear in cross-section; this is a common character, however, in pods which are nearly round, or even in pods which are much compressed laterally, they being greatly obcompressed when much arcuate; banner brilliant pink purple or darker, oval-ovate, sides reflexed 1½″ wide at a point opposite the keel tip and narrowing to nothing both ways; sulcus in the banner nearly cylindrical, 1½″ wide, and forming about ⅔ of a circle, 1″ deep and very broad and large, gradually shallowing upwards to the apex of the banner which is deeply notched; the white spot being ½″ above the keel and goes far below it, filling the sulcus and is M-shaped, purple-veined below and inclined to be stippled above, it reaches within 2″ of the tip of the banner; wings linear, 1″ wide, ascending, a little obtuse, tips horizontal and connivent over the keel, purple throughout, 1″ longer than the keel; keel straight, bent sharply to 90° and acutish, purple; calyx tube 3″ long and about 1½″ wide, ½″ thick. The stems are spreading or prostrate, 2–12′ long, and are often much tufted, growing in sandy or gravelly places from 4200° to 4600° altitude, near rocks on gravelly slopes, and occasionally hanging in festoons from crevices of the rocks. When growing this can only be separated from *A. amphioxys* by the pubescence and by the rather diamond-shaped leaflets, though in the dried plants the pod is very different.

ASTRAGALUS ARIETINUS.

No. 55540. June 30, 1894, Fairview, Utah, in gravel, 6500° alt.

No. 5208a. May 11, 1894, Cedar City, Utah, in gravel, 6000° alt.

This is the plant referred to by Watson in King's Report, p. 71, as a form of his *A. iodanthus*, but is reason-

ably distinct from that species, as an examination of his type shows. It is characterized by the large, hyaline, veiny, lower stipules, which are round to reniform or even obovate, 2–3″ long and nearly as wide, connate below; leaflets about 9 pairs; wings very long and straight, with white tips which are horizontal; calyx long; pods fleshy, the pulp often 1½″ thick, the innermost wall of the pod being almost woody, pods from nearly straight to coiled in a circle, cross-section from nearly round to almost didymous, according to the sulcation at the two sutures. The flowers are always purple, and the plants grow in tufts with decumbent stems and are very variable in the pubescence and pods, but seldom approach the type of *iodanthus*. It is No. 270 of Watson from Utah, and No. 269 from the West Humboldt Mountains, Nevada. It also occurs at Mammoth Hot Springs, Wyoming, on dry, rocky hills. It is very abundant throughout the Great Basin, but does not seem to occur outside of it, except at the north and northeast. For a fuller description of this plant, see Zoe, vol. iii, p. 294, under *A. iodanthus*.

ASTRAGALUS ARIETINUS var. STIPULARIS. Miss Eastwood, along McElmo Creek, S.W. Colorado, June, 1892.

Proper stems an inch or less long, densely covered with large round to oval hyaline stipules, 2–2½″ long, rarely broadly ovate and acute; perennial and cæspitose, strigose with very short hairs fixed by the base; leaflets 4–6 pairs, elliptical to obovate, obtuse, 4″ long or less, rather thick, proper petiole twice the rachis, slender, leaves 3′ long or less; peduncles subscapose, 2–3′ long, stout, capitately few flowered; bracts ovate and hyaline, 1″ long; calyx tube cylindrical, a little oblique, 3″ long, 1–1½″ wide, oblique and a little narrowed below, red-

dish, teeth about ⅓ the tube, triangular; flowers purple and like those of the type species; pods linear-oblong, 1′ long, 2½″ wide, either triquetrous or obcompressed, so that the cross-section is linear, sulcate deeply in the triquetrous forms except at base and apex, coriaceous, acute at apex and a little narrowed at base, nearly straight to arcuate to ⅓ circle, 1-celled, ventral suture raised, thin and sharp externally, pods green or mottled; perennial from an erect root; growing in sand. This is liable to prove a new species, and in that case may take the name *A. stipularis*.

Astragalus dorycnioides Douglas. Mr. Sheldon, l. c. 9, 145, says: "The difficulty which many botanists seem to have had in determining the limits of *Astragalus inflexus* Douglas and *Astragalus Purshii* Douglas has probably arisen from the nonconsideration of this species, which is intermediate between the two." Now since there is no room for any intermediate species between these two which almost shade together it becomes interesting to know the character of *A. dorycnioides* Douglas; the following is the description in G. Don, Gen. Syst. Gard. and Bot. 2, 258: "Plant erect, densely clothed with hoary silky villi; leaflets obovate-linear, obtuse; calyx smooth; racemes longer than the flowers; perennial. Native of North America near the Columbia River. Flowers purple. An elegant plant. Stipules distinct and free from the petioles; flowers in dense heads; banner linear and elongated. Pods straight." This plant is undoubtedly *A. succumbens*, but the specimens to which Mr. Sheldon has applied this name in the National Herbarium are nearly typical *A. Purshii*, and have not a single character in common with Douglas' description of *A. dorycnioides*.

It seems like stretching a point to extreme tenuity to make a new name for *Astragalus Thompsonæ* Watson on

the ground that there is an *Astragalus Thompsonianus* which is neither the same word in its spelling nor its origin and is at best only a synonym for *Astragalus nivalis*. On the same basis doubtless it was wise to load up *Astragalus nudus* Watson with another synonym since there is already another *Astragalus Watsonianus* (OK) which means the same as *A. Serenoi* (OK), *i. e.*, is named after the same person and so means exactly the same. Mr. Sheldon has also complimented Mr. Watson with *A. Watsoni* for *A. Hendersoni*.

ASTRAGALUS INTERMEDIUS, Arizona, Palmer. Type in National Herbarium.

Plants with the habit and general appearance of *A. amphioxys*, but pubescence with hairs fixed by the base, but pods much like *A. Bigelovii*. Perennial, cæspitose or tufted; stems very short, 1′ long, or less, densely covered with large imbricated, hyaline, puberulent, ovate stipules, 3–4″ long, or less; leaves 2–4′ long, silvery silky with short appressed white hairs; petioles half the leaf; leaflets 10–15 pairs, contiguous, oval, 3″ long, obtuse; peduncles scapiform, about 6′ long, rather loosely spicately flowered on the upper third, erect, not slender, sparsely pubescent; bracts ovate, hairy, hyaline, 2″ long, or less, much longer than the very short pedicels; flowers horizontal or ascending; calyx tube cylindrical, 3″ long, 1½″ wide, a little wider below, obliquely attached, very pubescent with short white or dark hairs; teeth subulate, 1″ long; banner oval, gently arched to 45° from calyx tips, blade about 4″ long, sides reflexed ½″ wide, claw rather long; wings oblanceolate, gently arched, a little longer than keel and 1″ shorter than the banner; keel straight, apex arched to 90° in a gentle arc to the blunt tip; flowers purple; pods oblong, 9″ long, straight, shortly acuminate with an oblique tip, truncate to emarginate at base, sessile

or very nearly so, 2½″ wide, 1½″ thick, obcompressed, very slightly sulcate ventrally, and broadly so dorsally, but not deeply, 2-celled except at the apex, velvety-pubescent with very short hairs, about one-third longer than the calyx and teeth, barely splitting the calyx tube.

Astragalus asclepiadoides Jones. Mr. Sheldon places this species under a new section, "*Asclepiadodes*" (l. c. 9, 159), in his provisional list, completely ignoring the fact that I had previously (Zoe 2, 238) made a section for it and called it "*Pachyphyllus*" (*Pachyphylla* by typographical error).

Astragalus ursinus Gray.

No. 5095ah. April 23, 1894, top of grade, four miles above Pagumpa, Arizona, 5000° alt., in gravel, among junipers.

This plant appears to be identical with *A. arietinus* when growing, but the 2-celled pod would place it elsewhere; when dry the greatly compressed, almost vetch-like pod is strikingly different. Stems often single, never many in a place, prostrate or ascending, always ascending in flower; flowers seem to be identical with those of *arietinus*, but paler; pods linear-oblong, cross section obovate-emarginate, wall fleshy and soft, the pulp ½″ thick and the pods 1½″ thick, ventral edge grooved, dorsal edge neither grooved nor ridged externally, but dorsal septum produced nearly to the ventral suture, the septum thin and white, and manifestly double; pod reddish, 1½–2′ long, arcuate to ⅓ of a circle, contracted but obtuse at both ends; seed cavity small and completely filled by the seeds, which are on stalks 1″ long; pods on reflexed pedicels, but arcuate so that the apex is ascending; stipules very large, blunt and sheathing below, mostly hyaline, almost reniform below, ovate above; bracts ovate, 1½″ long; pedicels almost none; peduncles 4′ long;

proper stems rather short; leaves 3–4 on the stem, about 7′ long, about 6–8 pairs of oval, obtuse, almost contiguous leaflets, 8″ long, 3″ wide, glabrous above, hoary below, as well as the stems; peduncles and petioles with white, short, narrow, appressed hairs, fixed by the base. This is a perennial, growing in gravelly soil among the junipers, on the mesa above the Grand Wash.

This seems to differ well from *A. ursinus*, and in case it should prove distinct, may bear the name *A. ensiformis*.

ASTRAGALIS NEWBERRYI var. CASTOREUS.

No. 5006. April 4, 1894, Copper Mine, 18 miles west of St. George, Utah, in gravel, 5000° alt.

Leaflets 2–3 pairs; calyx usually black-hairy, 8″ long, and teeth 1½″ long; corolla dark purple like the type, 5″ long; pod 1½′ long, arched into three-fourths of a circle and long-acuminate from the base, completely obcompressed at the base and not at all so at the apex, but rather compressed, shortly shaggy all over, with rather sparse hairs. In other respects this appears like the type, but the pod is very different. Because of the variability of the pod in this species I cannot consider this as more than a good variety.

This may prove to be too near to *A. cibarius* Sheldon.

ASTRAGALUS REMULCUS. Rusby, No. 576, Bangharte's Ranch, Arizona, May, 1883. Probably also G. R. Vasey, Kingman, Arizona, June, 1881. With the habit of *A. Shortianus*, and somewhat related to it. Perennial, rather stout, stems spreading over the ground, with erect or ascending peduncles; proper stems 6′ long, but may be much longer; puberulent; stipules triangular, green, adnate, not connate, reflexed, 2″ long; leaves 6′ or less long; the petiole one-third the rachis, and stout and sulcate: leaflets glabrous above, strigose below, with fine

wavy short hairs, fixed by the base, oval, 4″ long, thick, about 15 pairs, nearly contiguous, smaller above; peduncles 6′ long or less, stout, sulcate, capitately 14–20 flowered: not much elongating in fruit; bracts lanceolate hyaline, 1–1½″ long, twice the very short and stout pedicels: flowers spreading, purple, 8″ long, large; calyx tube a little obliquely cylindrical, 4″ long, 1½″ wide, somewhat compressed, obliquely attached below and a little narrower, light colored; teeth deltoid to triangular, and a little longer than wide; banner elliptical, blade 4″ long, sides reflexed 1″ wide in the middle, ascending beyond calyx tips to 45–60° in gentle curve; wings narrowly oblong, obtuse, arched 45°, 1″ wide, a trifle longer than the keel and 1″ shorter than banner; keel straight, apex gently bent to nearly 90°, rounded and obtuse, 3″ longer than calyx: pods oval-ovate, 6″ long, 4″ wide, sessile, glabrous, fleshy, much obcompressed, not sulcate, 1-celled, base rounded, apex upcurved, compressed, triangular-acute, 2″ long: fruiting peduncles apparently decumbent.

Astragalus Shockleyi. Perennial, apparently tall and coarse, stems coarsely sulcate, branches zigzag with nodes 2–4′ long; stipules very short and wide, very broadly deltoid, adnate, ½″ high or less, with a short apiculation, 1–2″ wide, with green tip; leaves with thick terete rachis, nearly as thick as the stems, 4–6′ long, stiff and ascending, scarcely sulcate, leaflets usually 2 pairs, distant, linear, 6–12″ long, thick, often deciduous; plants racemosely branched above, and almost glabrous throughout; the scant leaflets give the plants the appearance of being all stems and peduncles; pods obliquely oblong, about 6″ long and 3″ wide, round (when fresh) in cross-section, obliquely apiculate and obliquely inserted at base: dorsal suture nearly straight in the middle, but abruptly

bent at each end; ventral suture a little concave and thin, a trifle intruded, not at all sulcate; dorsal thicker, both sutures raised externally, dorsal suture intruded at least half way into the pod, except at the tip, where it is not at all intruded; walls cartilaginous, wrinkled both ways externally, pod sessile, but a trifle narrowed at the insertion; pedicels stout, 2″ long, ascending, and pods erect on pedicel. Very close to *A. nudus* Watson and *A. pachypus* Greene, differing from the former in the nearly 2-celled and smaller pod, from the latter in the short, sessile, round pod and few leaflets. Fish Lake valley, Nevada. Shockley, July 20, 1886.

ASTRAGALUS PRUNIFORMIS. This belongs to the *A. pachypus* group, Stems slender, ascending from a decumbent base, 1–1½° high, very coarsely sulcate, nodes 1–2½′ apart; leaves 3–4′ long; leaflets 6″ long, oblong, with a cuneate base, emarginate, 2″ wide, thin, pilose with fine, loosely appressed hairs, fixed by an enlarged base; peduncle stout, 6′ long, floriferous on the upper third; stipules subulate, green, 1″ long, reflexed in fruit; calyx campanulate, tube about 1½″ long, teeth subulate, and as long; pedicels stout, ½″ long, equaling the triangular-subulate bracts; stipe slender, 3″ long, ascending; pod in the fleshy state probably round in cross-section, and almost exact oval, 4″ long by 3″ wide, with much external pulp, when dry pods are lenticular in cross-section, parallel (transversely) ridged and reticulated, ventral suture ⅓″ thick throughout, dorsal also raised but thin, pod strongly apiculate, the point being a little above the middle of the end, 2-celled to the very apex, with the septum double and the parts separate; flowers not seen.

Butte County, Oregon, July, 1893, Mrs. Austin. Type in the National Herbarium.

ASTRAGALUS BERNARDINUS. Moronyo King Mine, east side of San Bernardino Mountains, California, 5000° alt., June 16, 1894, Parish. Type in National Herbarium.

This is closely allied to *A. tricarinatus* Gray, having the same rushlike round, rather tortuous stems, very similar pods, and peculiar pubescence of short, flat, closely appressed hairs fixed by the base, but it differs in being only 6′ high; stems flexuous and ascending; nodes 1′ apart or less; stipules triangular, green, adnate, free, evident; leaves 2–3′ long, with rachis like stems but smaller, green, tapering upward, arcuate, leaflets only ashy and equally so on both sides, flat, thickish, about 4 pairs, smaller toward tip of rachis, with very weak petiolules, distant, narrowly oblong, 6″ long by 1½″ wide, obtuse but not emarginate, equally rounded at both ends; peduncles proper only 1′ or less long, with rachis 3–4′ longer and racemosely flowered; flowers 6–10, reflexed; pods linear and narrowing below, apiculate, 1′ long, 1½″ wide at the end, ½″ wide at base, smooth, triquetrous, the back being a little narrower than the two sides and shallow sulcate, the sides a little concave, ventral angle acute, the others obtuse, completely 2-celled, cross-section Y-shaped, very finely netted, jointed at base, on a stipe nearly as long as calyx tube; calyx tube campanulate, 1″ long; teeth half as long, triangular; flowers not seen. Perennial, with many stems from a thick erect root.

ASTRAGALUS REVENTOIDES. Tweedy, No. 7, dry sagebrush areas, Grasshopper Creek, Beaver Head County, Montana, 5000° alt., August, 1888. This would pass for a broad leaved form of *A. reventus* were not the pod 2-celled or nearly so. Perennial, erect, stems short, 6′ long or less; leaves silvery on both sides with short fine appressed hairs fixed near the middle, 6′ long or less, stiff, rachis stout, equaling the petiole; leaflets oval to

elliptical, emarginate, a little narrower below, 6‴ long. 8 pairs or less: peduncles subscapiform, 1° long, erect, not stout, slightly sulcate, racemosely flowered on the upper third in fruit, pedicels slender, erect, 1‴ long; calyx campanulate 1½‴ long, with very short teeth; pods sessile, oblong-oval, 4-5‴ long; 3‴ thick, coriaceous, corrugated, somewhat fleshy when green, erect, obliquely apiculate, truncate at base, ventral suture straight, thick and rather prominent externally, dorsal narrow, not sulcate, nearly 2-celled by intrusion of dorsal suture, except at apex, pod nearly round in cross-section.

ASTRAGALUS RUSBYI var. LONGISSIMUS. This has the proper stems erect and only a few inches long, from a woody base; peduncles angled 1–1½° long, sparsely racemose on the upper two-thirds; flowers very small, about 1½‴ long; yellowish keel; wings and banner very short and blunt; calyx teeth minute; puberulent throughout even to the pods; leaflets 14–18 pairs, oblong-oblanceolate, emarginate; with no proper petiole. Type specimens in the National Herbarium. Dr. Palmer, Chihuahua, Mexico, 1885; Pringle same, by streams in the Sierra Madre Mountains, September 23, No. 1219. This has the pods more or less sulcate dorsally and broadly, septum a little intruded in the middle of the pod.

ASTRAGALUS RACEMOSUS var. BREVISETUS. Ramos, Zacatecas, Mexico, May 5, 1892, Jones. Calyx gibbous above, broadly oblong, 1½‴ long and 1‴ wide, spurred, setæ at base about 1‴ long; pedicels 1‴ long in flower, stout, longer than the ovate-subulate bracts; leaflets about 20 pairs; plants hoary with minute hairs. To this I refer Carleton's specimen, No. 221 from Cimarron Valley, Indian Territory, with few leaflets, and pedicels 2‴ long. Also Rydberg's from Curtis Creek, Fremont County, Nebraska, June 22. This is nearer to the type species however.

ASTRAGALUS RACEMOSUS var. LONGISETUS. This has very long hyaline, setaceous bracts as long as the calyx tube; often robust and with leaflets 3″ wide by 8″ long, elliptical, and large reflexed stipules. The specimens which form the types of this variety are in the National Herbarium. Wolf, No. 216, Apex, Colorado, June; Fort Collins, Colorado, on prairies; Sheldon, Pueblo, Colorado; Bodin and Eastwood, Denver, Colorado; Idaho, Hayden's Survey; Moose Jaw Creek, N. W. Q., on open prairies, Macoun.

Astragalus iodanthus Watson, Bot. King's Exp. 5, 70. This plant, which Watson confounded with a much better marked species *A. arietinus*, so far as the type is concerned belongs to western Nevada and adjacent California. It has slender stems; nearly glabrous throughout; flowers white, narrow, smaller; wings and banner usually equal; calyx lobes filiform-subulate nearly equaling the short tube; pods lanceolate-acuminate, completely obcompressed till the opposite sides touch throughout except at the tip; walls thin, merely coriaceous, pod mottled, minutely puberulent, 3–4″ wide, 1–1½′ long, less than 1″ thick. In some of its forms this approaches *A. lentiginosus*. Specimens in the National Herbarium besides the type are Sierras, California, Lemmon; Virginia City, Nevada, Curran, July, 1884.

Astragalus lotiflorus var. *brachypus* Gray. This plant seems to be a good species, but those most competent to pass an opinion on it, the field collectors of the plains, say that both this form and the type form are found on the same plant, the length of the peduncle being only accidental, this will reduce the variety therefore.

ASTRAGALUS LEIBERGI. No. 354, Sandberg and Leiberg, Egbert Spring, Douglas County, Washington, alt. 3500°, July 1, 1893. Type in National Herbarium.

Related to *A. arrectus*. Perennial; proper stems woody below, a few inches high, then branched in tufts, and branched 1′ or less long, covered with hyaline, imbricated, glabrous stipules 3″ long, adnate, not connate, subulate triangular; leaves filiform, 6′ long, petiole and rachis equal, tapering to a needle-like but not pungent point, erect; leaflets about 4 pairs, nearly filiform, 9″ or less long, deciduous, reduced toward tip of rachis, distant; peduncles subscapiform, 1–1½° high, erect, straight, thick, striate, floriferous on the upper fourth; flowers racemose, ascending, usually ochroleucous; pedicels stout, ascending, 1″ long, equaling the subulate bract; calyx campanulate, 1½″ long, about double the subulate teeth, hyaline; pods linear-oblong, 1′ long, 2″ wide, 1″ high, shortly-acute at both ends, a little arcuate, ventral suture thick and prominent externally, a little concave, dorsal suture convex, thin, broadly sulcate, intruded as a thin hyaline partition half way to the ventral suture, or at times almost touching the ventral suture, partition absent at the tip of the pod, walls of pod coriaceous, fleshy when green; stipe nearly double the calyx tube, thick especially above, pods erect.

To this I would also refer a more caulescent specimen from Spipen River, Washington, Wilkes' Exp., National Herbarium.

ASTRAGALUS ARRECTUS var. SCAPHOIDES. Dry sage-brush areas, 5500° alt., Beaver Head County, Montana, on hills west of Clark's Cañon, July, 1888. Very coarse and stiff, apparently 2° high or more, ascending, stems 3″ thick; peduncles 1° long, coarsely grooved; leaflets about 10 pairs, elliptical, 1′ long, ashy below, glabrous above, leaves 6′ long, proper petiole short; pods almost exactly those of *A. asclepiadoides*, but 2-celled except at apex, obcompressed, 1′ long, coriaceous, on a stipe 9″ long, which is arcuate so that pod is erect, pods 3″ thick

and 1½″ high; calyx tube 4″ long, with teeth 1″ long or less, triangular; flowers white; peduncles floriferous on the upper third. Type in National Herbarium.

Astragalus arrectus Gray. Mr. Sheldon has redescribed this species under the name of *A. eremiticus*, l. c. 9, 161, and Coulter and Fisher have done the same under the name of *A. atro-pubescens* in Bot. Gaz. I have seen the types of both species. Mr. Sheldon's name *eremiticus* I think can be maintained as var. EREMITICUS (Sheldon, l. c.) for the southern plant growing among the junipers in the Beaverdam Mts., Ariz., and vicinity (my numbers 5071, 5003, 5082b, 5098m, 5004e), which is a part of his type, but my specimens from Sprucemont, Nevada, included in his type are true *A. arrectus*.

ASTRAGALUS ATRATUS var. MENSANUS. No. 792, Coville and Funston. Along the Darwin road about two miles southward from Mill Cañon Divide, Darwin Mesa, Inyo County, California, May 20, 1891. Pods narrowly oblong, 1′ long, 2″ wide, obliquely apiculate, narrowed below into a very short stipe, puberulent, decidedly flattened, ventral suture very thick, dorsal thin and not at all sulcate; keel not produced; lower leaves elliptical, upper linear; whole plant ashy. Type in National Herbarium.

ASTRAGALUS CONJUNCTUS var. OXYTROPIDOIDES. No. 798, Howell, near the Dalles, Oregon, May 8, 1885. Leaflets 8–10 pairs, linear, rachis not greatly prolonged, leaves 6′ long or less; flowers white, 15–20; calyx teeth over half the tube, 1½″ long, subulate, hairs silky and white, flowers long and narrow; banner elongated, 2″ longer than the wings, blade at least 6″ long, oblong, ascending 30° remotely from keel; wings oblanceolate, nearly straight, 1″ longer than the keel; keel about 2″ longer than calyx

tips, straight or nearly so, apex bent in gentle curve to 90°, obtuse; pods 1′ long, 2″ wide, sulcate dorsally, narrowly oblong, shortly acuminate, very much resembling those of *Oxytropis Lamberti*; peduncles 1–1½′ long, sulcate, rather slender.

Astragalus Francisquitensis. Brandegee. San Francisquito, Lower California, October 18, 1891. Perennial, with many delicate stems, ascending, with the habit of *A. leptaleus*, but seeming near to *A. Nuttallianus*, nearly glabrous throughout; nodes 2–3′ long; stipules subulate, not united, adnate, 2″ long; leaflets 8–11 pairs, obovate-oblong to elliptical, emarginate, delicate, finely petiolulate; proper petiole 6–9″ long; leaves 4′ long; peduncles filiform, 6′ long, subcapitately 10–15 flowered; pedicels slender, ½″ long, about equaled by the triangular bracts; calyx campanulate-cylindric, tube 1½″ long by ¾″ wide, subulate teeth about half the tube, tube hyaline, nigrescent; banner blade 2½″ long, oblong, ascending 45°, the curve beginning beyond the calyx tips, sides reflexed, ⅓″ wide; wings linear, straight, ½″ wide, just about as long as banner, not at all arched (thus resembling those of *A. arietinus*), 1½″ longer than keel; keel short, very obtuse and rounded; pods linear-oblong, 6″ long by 1–1½″ wide, obtuse, sessile, completely 2-celled, glabrous, not sulcate, chartaceous.

Astragalus metanus. Hanson's Ranch, Lower California, near the border, Brandegee, April 18, 1885. Has the habit of *A. Inyoensis*. Prostrate from a perennial root, 2–3° long; stems rather stout and sulcate, minutely pubescent throughout with fine appressed hairs, fixed by the base, nodes about 3′ long, rather flexuous; stipules very small, green, reflexed, 1″ long, adnate, not connate; leaves 4–7′ long; proper petiole 1′ long on the lower leaves, but none on the upper ones; leaflets linear-lanceo-

late, barely acute, not contiguous, 1 ⅓′ long; peduncles about 1° long, floriferous on the upper third; flowers racemose, nearly sessile, with ovate bracts shorter than the pedicels; calyx broadly campanulate, tube 1″ long; teeth triangular and about one-third the tube; flowers purple; banner 3″ long, bent abruptly and remotely from the calyx tips to 45–90°, oval, sides reflexed; wings arched 60°, and exposing the base of keel, oblong, ¾″ shorter than the banner; keel abruptly bent to 110°, and apex produced to a point, 1⅓″ high, base of blade a trifle arched, about ½″ shorter than the wings, light colored; flowers horizontal, about 3″ apart; pods lenticular, much the shape of the *Kentrophyta* group when flat beaked, the upper ½ or ⅓ perfectly flat and triangular-acute, the ventral suture nearly straight, cross-section oval near the base of the pod, chartaceous, narrowed at very base, but sessile, lunate, 1-celled, seed-bearing in the middle, 4″ long, 2½″ wide.

The type is in the California Academy of Sciences.

Astragalus Julianus. San Julio, Lower California, Brandegee, April 19, 1889. This appears to be near to *A. sabulonum*. Annual, erect; inflorescence corymbiform by the shortening of the upper nodes; stems mostly shaggy with partly spreading hairs, except the rather shortly and sparsely pubescent pods; nodes 6″ to 1′ apart; leaves 4′ long, of 7–8 pairs of narrowly elliptical acutish leaflets, which are 6″ long and 1 to 1½″ wide; proper petiole 6–9″ long; peduncles stout, as long as the leaves, the rachis as long in fruit; flowers in a close raceme, lax in fruit, nearly sessile, reflexed and fruit also; calyx campanulate, tube 1″ long, subulate teeth about the same; pods obliquely-oval, swelled to circular in the middle, contracted at base, with a flat, triangular, acuminate beak, 2″ long, which is nearly central; ventral suture thick, not sulcate,

seed-bearing in the middle and seed stalks long, pods 6″ long by 3″ wide, papery; flowers nearly white, but purple tipped, apparently.

ASTRAGALUS SEROTINUS Gray, Pac. R. R. Rep. 12, 18 and 51, 1860, var. CAMPESTRIS (Nutt. T. & G. Fl. 1. 351, 1838.

Astragalus campestris Gray, P. A. A. 6, 229.

Astragalus convallarius Greene.

No. 6032b. September 11, head of the Sevier River, Utah, 8000° alt., in gravel, under *Pinus ponderosa*.

No. 6015n. September 7, Panguitch Lake, Utah, in volcanic gravel, under *Pinus ponderosa*.

No. 5958q. August 29, Brigham Peak, Utah, 11,700° alt., on open slopes, at and above timber line, in gravel.

No. 6002n. September 6, Panguitch Lake, Utah, in gravel, 8400° alt., under pines.

No. 5695h. July 27, Mt. Ellen, Henry Mountains, Utah, 10,500° alt., on open slopes, above timber line and below it, in volcanic soil; never seems to grow in any but well drained soil.

It is manifest, from an abundance of material from many localities, that this is only a variety of *A. serotinus*, since the calyx teeth and keel of the flower vary much, and show all sorts of intergrades.

As has been indicated above, *Astragalus strigosus* Coulter and Fisher, with its synonym, *A. griseopubens* Sheldon, is the same as *A. serotinus*.

ASTRAGALUS HOOKERIANUS (T. & G.) Gray, var. WHITNEYI (Gray P. A. A. 6, 526). An examination of a large amount of material from the California Academy of Sciences shows that this is only a variety of *A. Hookerianus*, as the characters do not hold.

Astragalus Virgineus Sheldon, Death Valley Rep., seems to be the same as *A. sabulonum* Gray.

Astragalus eremicus Sheldon, Death Valley Rep., was based on a very imperfect and small specimen of *A. Coulteri* var. *Fremonti.*

ASTRAGALUS COULTERI var. FREMONTI (T. & G. Pac. R. R. Rep. 4, 80). From a large amount of material I find transitions between this and *A. Coulteri*, but find that many specimens referred to this are really only forms of *A. lentiginosus*, and not truly referable to the type of *A. Fremonti.*

Astragalus No. 1961, Coville, Death Valley Rep. 277, is *Sophora stenophylla.*

Astragalus amphioxys Sheldon (not Gray) in Coville, Death Valley Rep. 85, Nos. 496 and 543 is *A. leucolobus* Jones, which is not the same as *A. lectulus* Watson.

Astragalus Purshii Sheldon (not Hooker), Death Valley Rep. 87, No. 119.6, from the Tejon Mountains, California, is also *A. leucolobus* Jones. Pringle's, from the same region, May 13, 1882, is the same. *A. leucolobus* is well marked by the roundish, long-villous pubescent leaflets; densely cæspitose habit; large lanceolate, hyaline bracts, 2″ long; usually black-hairy calyx (the pods are those of *A. Purshii);* hairy stipules; purple flowers, with banner having a striate purple-veined white spot; peduncles 2 to 6′ long, erect or spreading, always capitately 6 to 12 flowered, and flowers ascending.

Astragalus cibarius Sheldon. This well marked species was fully described by me in my Contributions, No. 3, 291, and I provisionally referred it to *A. glareosus*, but indicated its variance from that species, preferring to do that rather than to make a possible synonym. Mr. Sheldon, however, with very little material to work on and without exercising the usual courtesy in such cases, publishes it without even mentioning the fact that it had been previously and fully described by me. It is possible,

however, that its hasty publication prevented a proper examination of the literature on the species.

Astragalus Chamæleuce Gray. This name belongs to the *Phaca pygmæa* of Nuttall, but so far I can find no one who knows what that species is. The only character that seems assured is the habitat which is "Rocky Mountains, on the hills of Ham's Fork of the Colorado of the West," which means Ham's Fork, southwest Wyoming, on the northern slopes of the Uinta Mountains. So far as the description goes this might be some form of *A. amphioxys*, *A. cicadæ*, or *A. glareosus*. The forms collected by me have all been referred by others to *A. glareosus*, but an examination of authentic material of the latter species shows that my plants are not *A. glareosus*. They are identical with Watson's *A. Chamæleuce* Bot. King's Exp. 74. The stems are woody, flat on the ground, as if rooting; pods very variable, always pubescent, but sometimes sparsely so, walls fleshy and pulpy, 1″ thick, ventral suture thick and barely if at all intruded, a trifle sulcate ventrally, usually flattish on the dorsal suture, cross-section oval, the pod being obcompressed, usually 3″ thick and 4″ wide, vertical longitudinal section oblong and arcuate, 9″ or more long, horizontal longitudinal section oval-ovate to ovate, pods seldom over an inch long, jointed to a very short stipe, but often very deeply sulcate ventrally and even dorsally at base, the inner wall is thick and woody, but the outer is soft pulpy, cavity is full of hairs, showing that it is filled with juice during part of its growth, the cavity is double the width of the seeds when they are green; calyx $\frac{1}{2}$″ thick, 1″ wide and 4″ long, hyaline, thicker at base, cleft deeper above and lower teeth the longer. For further notes see my Contributions 3, 294. Should this prove to be distinct from *A. Chamæleuce* as is quite likely it may bear the name of *A. Uintensis*.

ASTRAGALUS CHAMÆLEUCE var. PANGUICENSIS.

This puzzling plant has the habit of the type and the pods of some forms of *A. amphioxys;* pubescence almost shaggy, very dense, of very fine and slender hairs fixed by the base; nodes usually longer than the triangular, hairy, green stipules, which are 2–3″ long; stems prostrate, 2–6′ long; root woody and with many short branches; leaves 2–3′ long, slender petiole longer than the rachis; leaflets contiguous, 6–8 pairs, elliptical, 2–3″ long, obtuse; pods linear-lanceolate, 1′ long by 2–3″ wide, short-acuminate, very much obcompressed till cross-section is linear, doubly sulcate throughout ventrally, ventral suture prominent externally, not at all sulcate dorsally, 1-celled, coriaceous and fleshy when young, finely and closely appressed-pubescent; flowers light purple, 9″ long; banner 4″ longer than the calyx and 1–2″ longer than the keel; calyx nearly cylindrical, but larger at the mouth, tube 4–5″ long, 1″ wide, subulate teeth 1″ long, calyx pubescent like the leaves, but less densely so, green, nearly sessile; bracts lanceolate hyaline, 2–3″ long; flowers in heads 6–8, on short peduncles, ascending; corolla like that of *A. Chamæleuce.* No. 6002m and 6023f, September 8, 1894, Panguitch Lake, Utah, 8400′ alt., in gravel.

ASTRAGALUS MUSINIENSIS.

With the habit of *A. Newberryi* Gray, but allied to *A. cicadæ* Jones. Densely cæspitose in small tufts, crown thick with coarse petioles and large, glabrous, triangular, nervose stipules, 4″ long, which, with the petioles, form heads at the crown; petioles stout, 1′ long, crowned by 1–3 lanceolate to elliptical-lanceolate leaflets, 1′ or less long; pubescence minute, dense and appressed throughout; pods ovate, 9″ long, 3–4″ wide, with an incurved and acute apex, very shortly-strigose pubescent, 1-celled, sulcate ventrally at base, cross-section nearly round,

outer coat loose; flowers not seen. This would pass for some form of *A. Newberryi* var. *eriocarpus*, but for the loose outer coat of the pod. It may be a reduced form of *A. cicadæ* or even of *A. Newberryi* var. *eriocarpus*, but the leaflets are of different shape, though in the latter species they are often reduced to three. No. 5454a. June 18, 1894, two miles south of Ferron, Utah, on clay slopes, at about 6000° alt.

ASTRAGALUS CICADÆ var. LACCOLITICUS.

Plants tufted, perennial, proper stems very short and nodes not longer than the triangular, green, very strigose stipules, which are 3″ long, adnate, not connate; leaves 3–4′ long, the petiole as long or longer than the rachis; leaflets 5–7 pairs, acute at both ends, nearly oval but apparently diamond-shaped, contiguous, 4–5″ long, 3″ wide; pubescence short, stiff, dense, appressed, fixed by the middle or near it; peduncles shorter or barely longer than the leaves, erect in flower and decumbent in fruit, capitately few-flowered; flowers like *amphioxys*, purple, 1′ long; calyx nearly half the whole, tube 4″ long, subulate teeth 1″ long, calyx tube cleft deeper above by a broad sinus, finely pubescent; flowers and fruit ascending; pods ovate to elliptical, acute, 1′ long, 5–6″ wide, rounded at base, puberulent when young, outer coat separating, but reticulations not evident. No. 5658q. July 21, 1894, at Cottrell's Ranch, Henry Mountains, Utah, 6000° alt., in volcanic gravel.

Astragalus lentiginosus Dougl. G. Don, Gen. Syst. Gard. and Bot. 2, 257, 1832; Hook, Fl. 1, 151. This is the most annoying group of forms in the genus, comprising all perennial forms of the group with 2-celled pods. The pods vary from membranous to cartilaginous and are connected throughout, the flowers vary from white to purple, and the shape of the pods from lanceolate to

oval-ovate at least, always acute and often acuminate. I have tried in vain to separate the forms into valid species. As a rule the sutures meet near the upper side of the pod by the great intrusion of the dorsal suture, but sometimes they do not quite meet, especially when old, pods often didymous by being deeper sulcate than usual.

ASTRAGALUS LENTIGINOSUS var. DIPHYSUS (Gray, Pl. Fend. 34, 1849. This includes all the purple and large flowered forms of eastern Nevada and Utah to Colorado and New Mexico and south to Arizona having membranous to chartaceous pods.

ASTRAGALUS LENTIGINOSUS var. MCDOUGALI (Sheldon, l. c. 9, 169). This seems to include *A. Rothrockii* Sheldon, l. c. 9, 174. This includes all forms with small and coriaceous pods.

A. LENTIGINOSUS var. CUSPIDOCARPUS (Sheldon, l. c. 9, 147). This includes all forms with acuminate, long and coriaceous pods. It is described by Mr. Sheldon as 1-celled, but authentic specimens from Leiberg's collection named by Mr. Sheldon are 2-celled. The range of this variety is northward, while the var. *McDougali* is mostly southward.

ASTRAGALUS LENTIGINOSUS var. CHARTACEUS.

No. 5627m. July 13, 1894, Ephraim, Utah, in clay. 6000° alt.

This plant is very nearly like the type in pubescence, the leaves being rather thick and almost wholly glabrous, from almost obcordate to obovate emarginate; the pods vary on the same plants in the width of the septum from less than $\frac{1}{2}$–2″ wide, but always 2-celled by being deeply sulcate ventrally, the walls are chartaceous, very delicately veined externally with parallel veins which throw off many veinlets which connect with each other, the pods are perfectly smooth with a triangular, incurved, short

tip, the cross-section is nearly didymous or very often with the re-entering angle on the dorsal side absent, pods 1–1½′ long and about 8″ wide, 3–5 in a very loose, subcapitate raceme which is shorter than the leaves; the flowers are like those of the type. This plant grows on flat clay land, in Sanpete valley, at about 6000 ft. altitude. It grows in clumps with nearly prostrate stems 4–8′ long. This may prove to be a mere form not worthy of varietal rank.

ASTRAGALUS LENTIGINOSUS var. NIGRICALYCIS. Bakersfield, Kern County, California, Miss Eastwood, March 24, 1893. Densely short-woolly-pubescent throughout, or velvety, except the less pubescent older leaves and mature pods; calyx densely black-hairy; leaflets obovate to oblanceolate, emarginate to truncate, 5–9 pairs; petioles and peduncles various; stipules triangular, small, reflexed; flowers white, 6″ long, in heads in flower and in short spikes in fruit; calyx campanulate to short-cylindric, tube 1½″–2″ long, 1″ wide, scarcely gibbous at base, teeth half the tube or less, subulate to triangular, calyx sessile or nearly so; bracts ovate, 1″ long; banner elongated, oblong, 3–4″ long, ascending 45–60° in gentle curve remote from calyx tips, sides reflexed ½″ wide most in the middle; wings narrowly oblong, nearly straight, a trifle longer than the keel; keel straight, apex gently arched to 90° in a uniform curve from apex to end of curve, shortly acute, 2–3″ shorter than banner; pods 1′ long, oval to ovate, always more or less lunate, chartaceous, mottled, tip short-triangular to short-acuminate, always incurved, 2-celled, sulcate ventrally; pods 3–7, flowers 10–15; perennial with ascending stems, 1–2° high. Also collected at Alcalde, California, May, 1881, Brandegee. Type in the California Academy of Sciences Herbarium, as well as my own.

ASTRAGALUS LENTIGINOSUS var. DIAPHANUS (Dougl. Hook. Fl. 1, 151). This precedes *lentiginosus* on the page, but I follow the usual rule of keeping up the long used name. This variety includes all papery pods which are linear, compressed and falcate, and may include *A. palans* Jones with its variety *araneosus* (Sheldon, l. c. 9, 170), though *A. palans* seldom has papery pods.

ASTRAGALUS LENTIGINOSUS var. LATUS Jones, Zoe 4, 272. *A. salinus* Howell.

This includes the prostrate forms with oval pods.

ASTRAGALUS PALANS Jones var. ARANEOSUS (Sheldon, l. c. 9, 171).

No. 5215e. May 14, 1894, Rockville, Utah, 3500° alt., in red sand.

No. 5163h. May 4, 1894, Silver Reef, Utah, in gravel, 3500° alt.

No. 5218. May 15, 1894, Rockville, Utah, in red sand, 3500° alt.

This is a variety of the type approaching *lentiginosus* var. *diphysus*, and appears to be the same as *A. araneosus* Sheldon, the type of which is in my collection.

Astragalus amphioxys Gray has for a synonym *A. crescenticarpus* Sheldon, being exactly typical; also *A. vespertinus* Sheldon, l. c. 9, 150, in which the pod is obcompressed. The flattening either into compressed or obcompressed is purely accidental in this species, and varies with the development and bending of the pod.

All the forms of *Astragalus amphioxys* are at once distinguishable from any forms of *A. Shortianus* by the pubescence, which is in the latter species fixed by the base, while in the former it is fixed near the middle, and therefore giving the plants a silvery appearance.

Astragalus Newberryi Gray. Having now gone over again and again the ground where this species was found,

and having gathered very many specimens of all forms, I am certain that this is identical specifically with *A. eriocarpus* Watson, and must therefore take the name. Unfortunately Watson's type is an abnormal form of his species, having grown in the shade, and therefore having abnormally long peduncles, but having collected it abundantly near his typical localities, and finding both long and short peduncles, according to the exposure, I have no hesitation in placing it here as a variety of *A. Newberryi*.

ASTRAGALUS NEWBERRYI Gray var. ERIOCARPUS (Watson, Bot. King 5, 71). This includes *A. candelarius* and var. *exiguus* Sheldon.

Astragalus Purshii var. *tinctus* Jones, Contributions 5. 269. *Astragalus lanocarpus* Sheldon is the same.

ASTRAGALUS SEATONI n. sp. Near to *Hartwegi*, but with slender stems. Collected by H. E. Seaton, on Mt. Orizaba, Mexico, 10,000° alt., August 6, 1891. Also by Bourgeau, at Cacubaya, near Mexico City, 1866. The latter plant is stouter, strigose and with fewer leaflets; pods papery; root thick. Seaton's plants have very slender ascending or spreading stems; leaflets linear or nearly so, 6–8″ long, 10–12 pairs; peduncles long and slender, 4–8′ long; spikes linear, loose, 1–2′ long; bracts scarcely visible; calyx almost globular, the tube about ½″ long and teeth one-third as long, triangular and black-hairy; flowers yellowish or white, sessile; banner round, not over 1″ long or less, sides reflexed, a little longer than the narrow-oblong wings, which are arcuate, and about one-fourth longer than the semicircular oblique keel; pods oblong-oval, 2″ long, 1″ wide, and cross-section nearly round, deeply sulcate and septum produced, but pods not wholly 2-celled, apiculate, very short stipitate. apparently jointed to the stipe; pods and flowers reflexed

and nigrescent, with short stiff hair; plants otherwise nearly glabrous.

ASTRAGALUS HORNII var. MINUTIFLORUS. Flowers about $2\frac{1}{2}''$ long; calyx teeth blunt and short; tube $1''$ long; pods nearly oval, with an acuminate beak, $2\frac{1}{2}''$ wide, $4''$ long, including the beak, 3–6 in a close head; a trifle sulcate ventrally, nearly smooth, and whole plant nearly smooth; peduncles slender, $2–2\frac{1}{2}'$ long, shorter than the leaves; this has the habit of *A. lentiginosus* var. *diaphanus*.

San Jorge, Lower California, Brandegee, March 17, 1889, on saline flats.

OXYTROPIS ACUTIROSTRIS (Watson, P. A. A. 20, 360, 1885).

Astragalus acutirostris Watson, l. c.

Astragalus streptopus Greene.

An examination of flowering specimens of Greene's species and of the duplicate type specimens of *A. acutirostris* make it certain that this is a true *Oxytropis* and not an *Astragalus*. A very valuable character separating this genus from *Astragalus*, which seems to have been at least partially overlooked, lies in the wings, which are always enlarged and lobed at the tip, generally very much enlarged and crumpled, and little like any American *Astragali*, though *A. calycosus* has lobed wings.

Should it be necessary to reduce this genus to *Spiesia*, the name must be *S. acutirostris* (Watson).

OXYTROPIS NOTHOXYS (Gray, P. A. A. 6, 232, 1866).

Astragalus nothoxys (Gray, l. c.)

Spiesia nothoxys (Gray).

This species is manifestly an *Oxytropis*, and has been confounded by most Arizona collectors with *A. Arizonicus*, having been distributed widely as that species.

HEDYSARUM BOREALE var. LEUCANTHUM (Greene, Pitt. September 20, 1892, page 294). *Hedysarum flavescens*

Coult. and Fisher, Bot. Gaz. 18, 300. Greene's name seems to be the older, and though the description is so meager that no one can tell what it belongs to, yet from the locality it is quite liable to belong to *H. boreale*. At any rate, *H. flavescens* is manifestly a form of *H. boreale*. Prof. Kelsey thinks this is more than an albino form, and so it seems to be. N. L. Britton, in the "Check List," considers *H. boreale* and *Mackenzii* as forms of the same species, but I certainly would not so consider them. *H. boreale* is separable from the other by the areolæ of the pods, being nearly as wide as long, by the calyx teeth very short and triangular, and by the short banner; in *H. Mackenzii*, the calyx teeth are long, the areolæ linear or nearly so, and the banner as long as the keel; there is some variation in the characters, but I have never seen specimens which could not at once be separated by the areolæ of the pods. The sporadic appearance of *H. boreale* in the southern part of its range is in favor of its identity with *H. Mackenzii*, but until its characters fail I see no way but to keep it up. The eastern forms of *H. Mackenzii* have smaller flowers and long filiform calyx teeth, so far as I have seen them.

LATHYRUS UTAHENSIS.

No. 5441l. June 15, 1894, Ireland's Ranch, Utah, at the head of Salina Cañon, in gravel, at 8000° alt.

This is the plant referred to, *L. paluster* var. *myrtifolius*, by Watson in King's Report and is Watson's No. 296. Whatever may be done with the apparently interminable forms of this genus in the Sierras and northward this species seems to be sufficiently distinct from them all to warrant recognition. Leaflets oval, 2′ long, obtuse at both ends and apiculate above, 4–6 pairs; stipules large and leafy, reniform and variously cut, 6″ high or less and nearly 2′ wide; peduncles 4–8′ long, usually about as

long as the leaves, rarely more, often less, 4–6 flowered: flowers 9‴ long, dirty purple or white; calyx lobes subulate-triangular, the lower about equaling the tube which is 1½‴ long; fruit half-elliptical, 2′ long; whole plant smooth, plants straggling upwards from 3–6° high, among oak brush. This plant which is very common throughout Utah at middle elevations varies but little. I refer here also Miss Eastwood's specimen, No. 1, from Durango, Colorado, and Ward's specimen from Utah collected in 1875. *L. pauciflorus* may be a starved form of this species, but from the imperfect material of that species it is impossible to tell what its limits are.

POTENTILLA UTAHENSIS var. CAMPESTRIS.

Ivesia Utahensis var. *campestris*.

No. 1624. Whitney Meadows, Sierra Nevada Mountains, California, 8500° alt., August 19. Coville.

Young leaves silky, long-villous; narrow leaflets 2½‴ long or less; plants less glandular, but otherwise the same, though a little more slender and leaflets not compacted.

AMELANCHIER ALNIFOLIA var. UTAHENSIS (Koehne, Die Gattungen der Pomaceen. Berlin, Ostern, 32, t. 2, 1890).

No. 5204d. May 10, 1894, Cedar City, Utah, in gravel, 6000° alt.

No. 5224n. May 15, 1894, Rockville, Utah, in red sand, at 3500 alt.

No. 5286k. May 22, 1894, Kanab, Utah, 5300° alt., on sandstone rocks.

No. 5149l. May 3, 1894, Silver Reef, Utah, on slopes, 3500° alt.

A large number of specimens from different localities and elevations show all sorts of variations in this most variable species, the variations being due to aridity and

exposure. I therefore place this variety where I did the original specimen collected by me in 1880, No. 1716. at Leeds, S. Utah, upon which the species of Koehne was founded. This would seem to be *A. pallida* var. *arguta* Greene.

All the numbers given above have acute leaflets, the following have obtuse and rounded leaflets and are nearer the type of *A. Utahensis*.

No. 5006a. April 4, 1894, Copper Mine, 18 miles west of St. George, Utah, 5200° alt., on rocky slopes.

No. 5289k. May 23, 1894, Johnson, Utah, 5000° alt., in rocky places.

No. 5312n. May 28, 1894, cañon above Tropic, Utah, 6500° alt., on slopes.

No. 5291e. May 25, 1894, 15 miles south of Pahria, Ariz., in gravel, 5000° alt.

No. 5663k. July 23, 1894, Marvine Laccolite, Henry Mountains, Utah, 6000° alt., in gravel.

No. 5095h. April 21, 1894, Pagumpa, Arizona. 4000° alt., in gravel.

No. 5082d. April 20, same locality.

PURSHIA TRIDENTATA var. GLANDULOSA (Curran, Bul. Cal. Acad. 1, 153). I agree with Mrs. Brandegee (Mrs. Curran) that this is only a variety of *P. tridentata*. Having examined all of Mr. Coville's specimens in the National Herbarium I failed to find constant characters.

POTENTILLA SABULOSA. IVESIA SABULOSA.

No. 6032. Sept. 11, 1894, head of the Sevier River among pines, 8000° alt., in compact gravelly clay.

This plant ranks next to *P. Kingii*, but very much resembles *Utahensis*. Stems erect, 6–9′ long, rather slender, growing in patches much after the fashion of *Arenaria Kingii*, and *Fendleri*; petals linear to oblanceolate, about as long as the calyx lobes; accessory calyx lobes minute,

obtuse, thickish; main calyx lobes ovate to triangular and acute; seeds 1–2, orbicular, nearly equaling the calyx, smooth; receptacle very setose; whole plant glabrous (but not glaucous) except the sparingly hairy upper stems and calyx tube; leaves $1\frac{1}{2}$–3′ long, linear, with broad, thick, densely imbricated sheaths below and thus forming close mats.

This plant abounds in pine forests at the head of the Sevier River, at about 8000 ft. alt., growing in very poor, somewhat gravelly, clay soil.

RIBES LACUSTRE var. LENTUM.

No. 56950. July 27, 1894, Bromide Pass, Henry Mountains, Utah, 10,000° alt., in gravel.

No. 5397k. June 5, 1894, Head of Bullion Creek, Utah, in gravel, at 10,000° alt.

No. 5684t. July 25, 1894, Mt. Ellen Park, Henry Mountains, Utah, 10,000° alt., in gravel.

Densely covered throughout with a yellowish, viscous pubescence, as well as soft hairs. This is the common form throughout the mountain region of Utah and Nevada, the pubescence being so viscous as to stain the sheets yellow in which the plants are collected. It is possible that the glutinous pubescence was overlooked in Gray's type of var. *molle*, in that case this will be identical with it.

ŒNOTHERA TRILOBA var. ECRISTATA.

No. 6015t. September 6, 1894, Panguitch Lake, Utah, on muddy shores, 8400° alt.

No. 5893r. August 23, 1894, head of Bullion Creek, Utah, 11,500° alt., in subalpine parks, in gravel.

No. 5174. May 22, 1894, Kanab, Utah, 5300° alt., in meadows.

No. 5638d. July 16, 1894, Burrville Sink, Utah, on muddy shores, 7500° alt.

No. 5397n. June 5, 1894, near Tate Mine, on Bullion Creek, Utah, 10,000° alt., in gravel, along stream.

No. 5312q. May 28, 1894, cañon above Tropic, Utah, in gravel, 6500° alt.

No. 6056ah. September 18, 1894, De Motte Park, Buckskin Mountains, Arizona, 9000° alt., in gravel.

No. 5957b. August 29, 1894, Brigham Peak, near Marysvale, Utah, 10,500° alt., in alpine meadows.

The western forms of this species have the pod destitute of a crest or lobe at the top. I have seen but one specimen west of the Plains (from California) that is truly typical, the rest belong to this variety. This species, like *brachycarpa*, has the wings reduced to nothing at the very base of the pod.

Œnothera brachycarpa Gray is said by Watson to be the same as *Œ. marginata* var. *purpurea* Watson Bot. King's Exp., but an examination of the type in the National Herbarium fails to establish the fact. The specimen is so immature and so poor that no one can say that it is not *Œ. cæspitosa*, and which it is far more liable to be. This would clear up the synonymy very much, as it is highly improbable that the species to which it has been referred would exist in subalpine situations, while its known home is the arid deserts, 4000° to 5000° above the sea.

Œ. SCAPOIDEA var. PARRYI (Watson, Am. Nat. 9, 270). *Œ. Parryi* Wat. l. c. This is manifestly only a variety with pedicels an inch or less long and a pod 3″ long.

ŒNOTHERA CARDIOPHYLLA var. PETIOLARIS.

Perennial, erect, stems usually simple, 1–2° high; rather finely pubescent and glandular; leaves cordate to nearly round or even ovate, about 1′ long; thick, veiny, coarsely dentate; petiole 1–3′ long; flowers in rather short terminal racemes, reddish, 6″ wide; stigma capitate, 1″ wide;

calyx tube narrowly obconic, 4″ long; calyx tips free; buds oval, 2″ long; petals round to rhombic, 3″ long; pods nearly sessile, straight or arcuate, 12–18″ long, 1½″ wide, blunt, scarcely narrowed at tip, bluntly 4-angled; seeds very small. The plants are inclined to be floccose-woolly.

Rosario, Lower California, Orcutt, April 30, 1886; Mojave Desert, California, May, 1884, Lemmon; Surprise Cañon, Panamint Mountains, California, Coville & Funston, Nos. 624 and 725; also No. 208, Funeral Mountains, California, 1891, same collectors. Types in National Herbarium.

ŒNOTHERA TENUISSIMA

No. 6083. September 26, 1894, Rockville, Utah, 4000° alt., in clay washes.

This plant belongs to the section *Chylismia* of Watson. Plants annual, very much branched throughout, forming a large, rounded, erect, bushy clump, 3° high or less, with very slender branches and long axillary and terminal racemes, about 8′ long; these are floriferous throughout; each flower is bracteate with a minutely pediceled, green, ovate to triangular bract below each pedicel; the bracts become minute above and gradually enlarged into small, acute, shortly-petioled leaves below. The main leaves are lanceolate, sparsely and very slightly and irregularly dentate, acute at both ends, on a varying petiole, with prominent primary and secondary veins below, which are often purplish; leaves minutely pubescent below, and sometimes with very delicate, sparse, white hairs; plants otherwise wholly glabrous, the blade of the leaf is usually about 10″ long, and the petiole as long or much shorter; pedicels usually 5–8″ long and filiform; pods clavate-oblanceolate, about half the pedicels, inclined to be 4-angled, obtuse at apex, a little less than 1″ wide; the

flowers in bud are oval, about 1½″ long, with a nearly linear tube, 1″ long, which sometimes becomes obconical; the petals are obovate to nearly oval, yellow, rounded, about 2½″ long; stigmas globular and style nearly as long as the petals. This is one of the most unique species in the genus, and is very noticeable on account of its size and delicacy. It grows only in barren clay soil.

CYMOPTERUS NEWBERRYI var. JONESII (C. & R. Umbelliferæ 50).

No. 5422g. June 14, 1894, Salina Cañon, Utah, near the mouth, 5200° alt., in gravel.

In publishing *C. Newberryi* var. *alatus* as a synonym for this plant, I overlooked the fact that *C. Jonesii* C. & R., does not antedate this species by position, and therefore the name given above must stand, while the latter name, if any, must be changed.

CYMOPTERUS UTAHENSIS.

No. 5098. April 23, top of grade above Pagumpa, Arizona, in clay among junipers, 5000° alt.

No. 5098h. April 23, 10 miles south of Black Rock Spring, Arizona, 4500° alt., in gravel.

No. 5098p. April 23, Black Rock Spring, Arizona, 4500° alt., in gravel.

This plant has the habit of *C. montanus* and is the same as the variety *purpurascens* of Watson in the Botany of California, but not of Gray in the Botany of Ives' Expedition. Peduncles in fruit always as long or longer than the leaves, nearly erect, rarely decumbent; flowers purple; involucels thin, hyaline, with 1–3 narrow and green nerves but otherwise white and papery or sometimes purplish; involucres also large and similar; lobes of both involucres and involucels variable but usually roundish to oblong and rounded at tip; fruit large, oval, with very wide wings, at least 4″ long and with the wings nearly as wide,

the body elliptical, wings 2″ wide or more, fruit deeply emarginate above and below, oil tubes 2–3 in the intervals and 4 on the commissure; leaves ovate in outline, the blade 1½–2½′ long, glaucous, thick, segments in the typical form nearly contiguous, very small, ovate to nearly square; old leaf-sheaths very persistent at the crown, the green sheaths large, hyaline, nerved and usually colored; root long, erect and fleshy. In other respects this plant closely resembles *C. montanus*, having the same very thin wings without any enlargement except next the seed and all nearly equally developed.

This is No. 1685 of my Utah collection, and abounds on the clayey and gravelly plains, valleys and lower hillsides throughout Utah and Nevada.

A common form of this species is the variety MONOCEPHALUS Jones in Herbarium, having the umbellets densely congested into a single close head, especially in fruit; the leaves are much reduced and the segments contiguous or imbricated. This form is *C. montanus* var. *globosus* Wats. in King's report as to the fruit; it is also his specimen from the Trinity Mountains, Nevada. The type of this form is my specimen gathered at Terminus, Utah, in 1890. To this I also refer a specimen from Candelaria, Nevada; also Palmer's specimen from Pocatello, Idaho, probably Marsh's specimen from Ft. Wingate, New Mexico, and possibly a specimen of Whipple's Expedition ticketed "California." All the above specimens are in the National Herbarium, there being a duplicate of my type in the Herbarium.

CYMOPTERUS UTAHENSIS var. EASTWOODÆ.

Much more robust than the type with stems sometimes 16′ high and occasionally somewhat caulescent; rays 1–2′ long; fruit narrower and often much longer proportionally, usually with thin wings 1–1½″ wide, generally

truncate or barely emarginate at both ends; oil tubes 2 to 4 in the intervals and 6 to 8 on the commissure; wings somewhat corky-thickened next the seed; leaves lanceolate and the segments rather distant and larger; involucres and involucels as in the type species. The type of this variety is Miss Eastwood's specimen from Durango, Colorado, collected June 3, 1890. This variety was previously collected by me on May 2, 1890, at Cisco, Utah.

Mr. Rose had studied this form and given it a name in the National Herbarium, but now considers it to belong to this species.

Cymopterus montanus Nutt.

What I take to be the typical form of this species, whose home is on the plains of Colorado, Wyoming and New Mexico, has the flowers sessile, or nearly so, among the leaves, and even in fruit the peduncles are usually very short, not as long as the leaves and decumbent; involucre a narrow, irregular, hyaline border; involucels always conspicuous, with very wide hyaline border and triangular and green center, but variable in size; flowers white; fruit never wider than oval, usually 3″ long; leaves never sheathing above the ground, prostrate on the ground. Specimens of this species in the National Herbarium are from Fort Lyon, Arkansas, Palmer; Denver, Colorado, Eastwood; Pueblo, Colorado, Hicks; No. 210 from Colorado, Hall and Harbour; Fort Russel, Wyoming, Ruby; and Laramie, Wyoming, Nelson.

C. MONTANUS var. PEDUNCULATUS.

This is a peculiar form or quite possibly a new species with long, erect peduncles often double the leaves, with rays 1′ long; involucres reduced to a mere rudiment; involucels linear to oblong and small; fruit small, about $2\frac{1}{2}$″ long, oblong, emarginate above and below; wings nearly 1″ wide, rather wider below, and gradually thick-

ened towards the seed; oil tubes 3–4 in the intervals and about 6 on the commissure; involucels divided to the base and pinnate-nerved; root abruptly tuberous-enlarged. The types of this variety are Woolson's specimen from Dallas, Texas; Reverchon's, same locality, with narrower wings.

I refer here with much hesitation a specimen from Fort Belknap, collected by Sutton Hayes, for this may belong to *Utahensis* var. *Eastwoodæ*, described above.

Cymopterus purpurascens (Gray, Bot. Ives, 15) Jones.

No. 5002. March 30, 1894, at the foot of the grade above Bellevue, Utah, in gravel, 3700° alt.

No. 5140c. May 1, 1894, Washington, Utah, in alkaline clay, on flat, 3000° alt.,

No. 5196m. May 8, 1894, Le Verkin, Utah, in gravel, 3700° alt.

To this I also refer a specimen from the Uinkaret Mountains, South Utah, collected by Mrs. Thompson in 1892; Rusby's from Mangus Spring, New Mexico; Lemmon's from Peach Spring, Arizona; Bishop's from south Utah; McDougal's from the San Francisco Mountains, Arizona; Dr. Mearns' from the Carrigallilo Mountains, New Mexico, collected April 17; and the central specimen on the sheet marked *C. montanus* from the Mexican Boundary Survey; all these being in the National Herbarium.

This species is very marked by its long peduncles, at least longer than the leaves; by its purple and greenish, not hyaline (except on the very margin), many nerved, barely lobed, large, rounded involucels, which in flower are cup-like and inclose the brilliant-purple flowers, simulating one of the *Compositæ;* involucre similar and either of ovate and acute or wider and obtuse lobes which are either very large or sometimes reduced even to a rudi-

ment, but always with more or less of a hyaline margin; fruit about 6″ long, nearly round to oval and deeply emarginate above; wings 2–3″ wide, with a narrow, corky margin next the seed; otherwise very thin; oil tubes 3–4 in the intervals and 8 on the commissure, not evident externally; leaf sheaths enlarged at the base and stems covered below with long, hyaline leafless sheaths; leaves from fully to barely bipinnate, with obovate, often lobed divisions, always glaucous and thick, 3–4′ long, mostly ovate in outline, with petiole equaling or exceeding the blade.

CYMOPTERUS GLOMERATUS var. PARRYI (C. & R. Umbell. 50) Jones.

Coloptera Parryi C. & R. Umbell. p. 50.

Cymopterus Parryi (C. & R.) Jones, Zoe, 4, p. 49.

I do not adopt the obsolete name *C. acaule* (Pursh).

An examination of the material referred to this species in the National Herbarium shows that the specific character does not agree with the generic character given by Coulter & Rose under *Coloptera*, the flowers being white instead of yellow. The other two species described by them, as I have already indicated in Zoe, 4, p. 49, have a minute hyaline involucre, while this species has no trace of any, and therefore must be compared with *Cymopterus glomeratus* and not with *C. Fendleri*. On comparison with a large suite of specimens of *C. glomeratus* there is absolutely no character of leaf, habit, or inflorescence to separate this species from that. The only character, and that a variable one, lies in the wing of the fruit, which in some specimens is quite thick on the outer edge and with only a rudimentary thin prolongation beyond, but in other specimens the prolongation is more pronounced. In some specimens of *C. glomeratus* in the National Herbarium from the plains, the corky portion of the wing is quite narrow

and without the slightest evidence of a thin prolongation beyond, but the specimens are referred to *C. glomeratus* because of the less thickened wing. I have shown in Zoe that *C. glomeratus* shares with *C. Fendleri* the character of a thickened central portion of the wing, that portion next the seed being fully as thin as the portion outside of the corky part. In view of these facts I see no escape from making this a variety of *C. glomeratus*, whose geographical range seems to be that portion of the Great Plateau west of the plains, including western Wyoming, Idaho and Montana.

Peucedanum triternatum var. *alatum* Coulter and Rose is a true *Pseudocymopterus*, with raised winged ribs, and certainly connects *Peucedanum* with *Cymopterus*, as the latter genus is now received. If *Pseudocymopterus* is to be retained its limits certainly must be changed.

MENTZELIA MULTIFLORA var. INTEGRA.

No. 6082c. September 26, 1894, Rockville, Utah, 4000° alt., in red sand.

No. 5419e. June 14, 1894, Salina Cañon, Utah, four miles up, at 5300° alt.

No. 5263. May 19, 1894, on grade south of Rockville, Utah, in clay, 4500° alt.

Leaves oblanceolate, simply and bluntly toothed or lobed; flowers long pediceled and bractless; seeds nearly orbicular, large, broadly winged. To this I refer Palmer's specimen from southern Utah, No. 171, referred in the National Herbarium to *M. chrysantha*.

This grows on very barren clay soil.

Symphoricarpus rotundifolius Gray.

No. 5261m. May 17, 1894, Springdale, Utah, 4000° alt., in red sand.

No. 5447d. Salina Pass, June 16, 1894, 8000° alt., in gravel.

No. 5312ay. May 28, 1894, cañon above Tropic, Utah, in clay, 6000° alt.

No. 5441t. June 16, 1894, Salina Cañon, in gravel, 8000° alt.

No. 5639. July 17, 1894, Loa Pass, Utah, 8000° alt., in gravel.

No. 6015w. September 7, 1894, Panguitch Lake, Utah, 8400° alt., in gravel.

No. 5289n. May 23, 1894, Johnson, Utah, 5000° alt., in gravel.

No. 5137. April 30, 1894, Santa Clara valley, Utah, 5000° alt., in gravel.

SYMPHORICARPUS ROTUNDIFOLIUS var. OREOPHILUS (Gray).

Symphoricarpus oreophilus Gray, Jour. Lin. Soc. xiv.

The characters given by Gray do not hold out, but there is shading from one into the other at all points.

BIGELOVIA DOUGLASII var. SPATHULATA.

No. 5758m. August 6, 1894, Fish Lake, Utah, in gravel, 9000° alt.

This shrub has the habit of *B. Douglasii*, but all the lower leaves are spatulate to oblanceolate, while the upper leaves are linear, acute, and generally a little twisted, thus approaching *B. Vaseyi* on the one hand, and *B. Douglasii* on the other; the flowers are a little glutinous, and the leaves sparsely ciliate on the margin; the stem is scabrous, otherwise nearly glabrous; the heads are sometimes slightly floccose; scales usually in threes, never more, obtuse or barely acute, not at all keeled, the outer ones green towards the apex and oblong, and the inner ones linear and almost wholly hyaline; corolla lobes reflexed and triangular; style branches much exserted, and hispid not quite half their length; akenes pubescent throughout.

To this I also refer the two doubtful specimens:

No. 5095aj. April 23, 1894, four miles above Pagumpa, Arizona, 5000° alt., in gravel.

No. 5264c. May 19, 1894, near Smithsonian Butte, Utah, 5000° alt., in gravel.

BIGELOVIA TURBINATA.

No. 6066c. September 24, 1894, Canaan Ranch, Utah, 5000° alt., in gravel.

This species seems to be next to *B. juncea*. Bracts 5–6 in each row, the lowest minute and often loose, all obtuse or only apiculate, and all with a darker center, as if keeled, oblong to linear, innermost 4″ long and 2″ wide, shorter than the flowers; pappus white; corolla oblanceolate-cylindrical, with minute, ovate, appressed lobes; style appendages filiform; anther tips nearly linear: plants glabrous and a little glutinous even to the flowers; leaves sparse, long, canaliculate, uppermost reduced to mere rudiments. This has the habit of the allied species, being about 4° high, in a rounded, bushy tuft or shrub, and grows on clay soil on the borders of an old sink.

BIGELOVIA HOWARDI var. ATTENUATA.

No. 5847a. August 21, 1894, Marysvale, Utah, 6500° alt., in gravel.

No. 6106k. October 7, 1894, divide north of Beaver, Utah, 7000° alt.

No. 6052k. September 17, 1894, Buckskin Mountains, Arizona, 9000° alt., in gravel.

No. 5912. August 27, 1894, Marysvale, Utah, 7000° alt., in clay.

Usually with green stems, rarely whitened; heads viscous; leaves linear to filiform; all the bracts long-attenuate, not coriaceous, passing into green and similar involucral leaves; flowers rather inclined to occur in heads or short corymbs, fully equaling the leaves, light-

yellow; bracts as long or longer than the pappus. I take as the type of this variety my Nos. 5912 and 5847a, and also refer to it No. 6052k and possibly No. 6106k. I also refer Newberry's specimen gathered in McComb's Expedition. Other specimens which belong near here, but with white or whitish stems, are:

No. 6002aa. September 6, 1894, Panguitch Lake, Utah, 8400° alt., in gravel.

No. 6039b. September 12, 1894, Elk Ranch, Utah, in gravel, 7000° alt.

No. 5989i. September 4, 1894, Circle Valley Cañon, in gravel, 7000° alt.

BIGELOVIA MENZIESII var. SCOPULORUM.

No. 5204v. May 10, 1894, near Cedar City, Utah, 6000° alt., in gravel (altitude probably too high).

No. 6074. September 23, 1894, above Springdale, Utah, 4000° alt., on sandy and gravelly slopes.

This plant is near to *B. Menziesii*, but is characterized by very long nearly linear, 3-nerved entire leaves, from 2–3′ long and 2–4″ wide, acuminate at each end; the plants are woody below, very sparingly branched and the branches very long and almost rush-like, erect, and with gradually reduced leaves towards the inflorescence which is corymbose, of few clusters of 3–5 heads; heads yellow, 5″ long, 10 or more flowered; bracts gradually reduced to minute scales at the base, all being rounded and without distinct, green tips, the inner bracts narrowly oblong and only a little shorter than the flowers, all glabrous; fruit linear, hispid; pappus of very delicate white and strongly barbellate, unequal hairs, nearly as long as the flowers; calyx lobes linear, and as long as the anthers; style branches very hispid and long, and stigmatic portion short.

This plant grows on rocks and on rocky hillsides in the cañon of the upper Virgen river above Springdale, Utah.

BIGELOVIA SQUARROSA (H. & A.) *Aplopappus squarrosus* H. & A. Bot. Beech. 146. This seems to me much better placed in *Bigelovia* and is close to *B. Menziesii*.

BIGELOVIA MACRONEMA (Gray).

Aplopappus macronema Gray, P. A. A. 16, 80.

Macronema discoidea Nutt., Tr. Phil. Soc. n. s. 7, 322.

No. 5940r. August 28, 1894, head of Bullion Creek, near Marysvale, Utah, in gravel at 11,500° alt.

No. 5895. August 24, 1894, Falls of Bullion Creek, near Marysvale, Utah, 9500° alt., in gravel.

It has always seemed to me that this species is a better *Bigelovia* than *Aplopappus;* in fact it is so close to *B. Bolanderi* that it is very difficult to separate the two species. I leave it for other botanists to determine whether the other species in the section *Macronema* of *Aplopappus* of Gray shall be transferred to *Bigelovia*. In my judgment, however, the dividing line is better left here. In discussing the species of *Macronema*, E. L. Greene curiously enough says that this group is most nearly allied to *Chrysopsis*. He fails to see that *Macronema* passes directly into *Bigelovia* and that it is well nigh impossible to separate specifically *Bigelovia Bolanderi* and *Aplopappus macronema*, while there is a direct transition to true *Bigelovia* through these species and *B. Parryi, Nevadensis, Howardi*, etc. I caunot follow Mr. Greene in his work on *Bigelovia, Aplopappus*, and allied genera.

BIGELOVIA LEIOSPERMA var. ABBREVIATA.

No. 6105. October 7, 1894, mouth of Clear Creek Cañon, Utah, 6000° alt., in clay.

Very minutely pubescent throughout, not at all floccose; leaves mostly very much reduced and almost scale-like, linear, 4‴ or less long, apiculate, barely flattened; scales nearly all linear and with only a trace of green at the tip, not at all keeled; flowers mostly double the rather

short pappus, the upper half of the tube being inflated and fusiform and with rudimentary closed teeth; nerves very prominent, glabrous; style branches subulate-filiform and hispid for more than half their length. This is a small shrub about 1° high, branched at the base and forming a rounded tuft of rather slender branches covered with the scale-like leaves, the flowers are cream-colored or light yellow and are clustered at the end of the branches, rather corymbosely, in heads of five or more.

This grows on very barren clay soil, at the foot of the mountains where almost no other plant will grow.

CHRYSOPSIS CÆSPITOSA.

No. 5249u. May 16, 1894, Springdale, Utah, in red sand, 4000° alt.

Cæspitose from a woody much branched root, forming a dense mat; leaves spatulate 6″ long, clustered on very short (13–20″ long) ascending stems, very villous but not hispid, apiculate; heads 3″ high, sessile; scales ashy-green, linear, somewhat unequal, inner with purple and hyaline margins and acute; flowers yellow, rays dark and short; outer pappus setulose. This is a very striking plant, but may be an extreme form of *C. villosa*.

This plant grows in very sandy soil covering sandstone rocks, and seemed to be very scarce.

ASTER GLAUCUS var. WASATCHENSIS.

No. 5861. August 22, 1894, Tate Mine, near Marysvale, Utah, 9000° alt., in gravel, on mountain slopes.

Plants glandular above; scales broad and with green, foliaceous, spreading tips; plants densely tufted, branched above, 1–2° high.

ASTER THERMALIS.

No. 5410. June 7, 1894, Monroe, Utah, 5500° alt., in warm springs on lime tufa.

Perennial, with rather fleshy-fibrous roots, growing in

tufts near alkaline hot springs; stems not in the least woody, rather flexuous and rush-like, erect or ascending, 9′–1½° high, glabrous below, glandular above and very heavily scented; leaves grass-like, 2–7′ long, 1″ wide, fleshy, sessile, a little clasping, the uppermost leaves bract-like; scales in about 3 irregular series, green, appressed, acute, linear; rays ½″ wide, 6″ long, purple, very conspicuous; disk-flowers light yellow; akenes linear, ribbed, villous; pappus very frail and rather scanty; flowers racemose, few, long-peduncled, 6″ wide and disk 3″ high.

This plant is never found except in water flowing from alkaline hot springs which are heavily charged with lime, bicarbonate of soda and chloride of sodium. The soil in which it grows is always very poor and thin, covering lime tufa. It seems to be the only aster which will grow in such places. It is never found in high elevations nor does it occur outside of the plateau region of Utah.

ASTER TORTIFOLIUS var. FUNEREUS. No. 358, Coville, Death Valley Rep. Furnace Cr. Can. Funeral Mts., Cal., Jan. 30, 1891, and No. 863, near Keeler, Cal., May 16. An intergrading form is his No. 184 from Brown's Peak, Cal., Jan. 16. This variety has closely imbricated scales, in many series, gradually reduced below, not attenuate, closely appressed.

Aster xylorhiza T. & G. This differs in no real respect from *A. Wrightii* and *A. venustus* except that it is lower and has longer leaves. *A. venustus* Jones answers to *A. Parryi* of the same section.

ERIGERON CINEREUS var. ARIDUS.

No. 5149v. May 3, 1894, Washington, Utah, 3500° alt., on sandstone rocks.

This plant seems to be near *E. divergens* in general appearance, but is shrubby at the base; heads 8″ wide,

including the rays which are very many and narrow, 3″ long, purple; bracts green but sparsely hispid; lower leaves pinnatifid with distant linear lobes; leaves oblanceolate-linear, on long petioles; upper leaves sessile, linear, 20″ long; flowers corymbose above, heads long-pedunculed, with gradually reduced, bract-like leaves on the peduncles; plants erect, 9–18′ high, growing in clumps in the crevices of hot sandstone rocks in the most exposed situations. I also refer to this a plant collected by Vasey in 1881 in California, and by Dr. Smart on the Verde River, Arizona, in 1867, both being referred to *E. divergens* and both being barely woody at base.

ERIGERON CÆSPITOSUS var. NAUSEOSUS.

No. 5386. June 2, Marysvale, Utah, 8300° alt., in gravel at the base of the mountains. Grows in tufts in exposed and hot places.

Very leafy, root leaves 3′ long or less, spatulate to obovate, 12″ or less, upper ones obovate, 1′ long by 6″ wide, sessile, almost clasping; whole plant scabrous and the leaves rough ciliate; heads mostly single, on the long, ascending, very leafy stems; proper peduncles about 1′ long; plants glutinous above and with a very nauseating odor; scales abruptly attenuate at tip, rough, not hairy.

This abounds on dry, rocky slopes and cliffs at the foot of the mountains.

ERIGERON CÆSPITOSUS var. LACCOLITICUS.

No. 5661. July 23, Marvine Laccolite, Henry Mts., Utah, at 6000° alt., in volcanic gravel. Grows in tufts.

Stems many from a much branched, woody root, covered below with imbricated leaf-petioles, stems about 1° high, mostly erect or ascending, several flowered; flowers small, 3″ wide exclusive of the rays; root-leaves 4′ or less long, oblanceolate, on a long and winged petiole,

rounded, upper leaves all sessile, oblong or narrower, 1′ long or less by 2–2½″ wide; heads short-peduncled; whole plant ashy and very rank smelling.

This grows in very dry places at the base of the mountains. I also refer to this variety Ward's No. 560 from the same region.

Townsendia montana Jones was again collected in 1894 and seems to hold its characters well.

TOWNSENDIA FLORIFER var. COMMUNIS.

No. 5322f. May 30, 1894, Kingston, Utah, on basaltic knolls, 5300° alt.

No. 5315b. May 28, 1894, ten miles south of Coyote, Utah, on lava, 6500° alt.

No. 5323. May 31, 1894, Marysvale, Utah, 6000° alt, in gravel.

This is the cæspitose form, with simple stems and large flowers, 12″ wide or less, with acuminate rays. To this variety I also refer a specimen from Howell, collected on the Columbia River, opposite Umatilla, April 29, 1882, this specimen being in the National Herbarium.

The typical form of *Townsendia florifer* has ascending and branching stems, with 2–4 long-peduncled, small heads, about 6″ wide and high, with rays 3–4″ long; scales ashy, strigose outside, and imbricated; pappus equal; not more than a winter annual, about 5½′ high; flowers purple; leaves linear-spatulate, 3′ long or less.

APLOPAPPUS LINEARIFOLIUS var. INTERIOR (Coville, Biol. Soc. Wash. 7, 65, 1892).

Aplopappus interior Coville, l. c.

No. 5149u. May 3, 1894, Silver Reef, Utah, on rocks at 3500° alt.

No. 5060. April 14, 1894, Mica Spring, Nevada, in granitic gravel, 4000° alt.

No. 5045n. Same locality and date.

No. 5297l. May 26, 1894, Pahria Cañon, Utah, 5300° alt., in sand.

After looking over all the specimens obtainable on these two species, I can only consider *A. interior* Coville as a geographical variety of *A. linearifolius*, as transitions seem to occur at all points. Mrs. Brandegee has already called attention to this as a variety.

GYMNOLOMIA MULTIFLORA var. ANNUA. All the forms of this species growing in our northern mountains are perennial, as described by Nuttall; those growing on the arid plains of the south are annual, and with quite a different habit; the heads are decidedly conical, the plants are more delicate and slender, often only a few inches high. The variety ranges from southeastern Utah to Mexico and westward, but I have never seen it in the Great Basin.

TETRADYMIA SPINOSA var. LONGISPINA.

No. 5110. April 26, St. George, Utah, in red sand, on the slopes of Triassic rocks, at 3000° alt., growing in tangled clumps about three feet high. Soil a little alkaline.

Shrub 3–6° high, with rounded top and long, slender, intricately interlaced branches, closely and permanently woolly, branches rather tortuous; primary leaves 6–12″ long, linear-spatulate, tomentose, straight or nearly so, horizontal to somewhat deflexed, never hooked, becoming long slender spines, 1′ long, like those of *Opuntia rutila*, but not so long; secondary leaves fleshy, smooth, linear, but a trifle widened above, 6″ long; scales 3″ long, oblong; heads 4″ long, on a peduncle 1″ long or less; flowers about 6–10 in a head; young branches never elongated. This differs very markedly from the type in the long spines and in its habitat, but there are transitions in the National Herbarium.

This grows only in the Larrea belt, and abounds on drifting sand dunes in the hottest places.

CHÆNACTIS CARPHOCLINIA var. ATTENUATA (Gray, P. A. A. 10, 73).

Chænactis attenuata Gray, l. c.

No. 5036au. April 13, ten miles below Mica Spring, Nevada, in gravel, at 2000° alt.

No. 5045r. April 13, three miles below Mica Spring, Nevada, in gravel, 4000° alt.

These specimens have very many awns on the receptacle. It would seem that the presence or absence of awns is accidental rather than specific. This fact also noted by Mrs. Brandegee, in Zoe.

F. V. Coville, in the Botany of the Death Valley Exp., p. 134, says: "This plant has not been reported since its original discovery." It was collected in 1884, by me, at Yucca, Arizona, and reported in my lists published in the same year. See "Flora of Arizona, First Fascicle."

Chænactis carphoclinia Gray.

No. 5036z. April 13, near Hole in the Rock, 8 miles above Stone's Ferry, Nevada, at 1500° alt., in gravel.

There is a great deal of doubt in my mind of the validity of the characters in this group. In this particular number there are no awns on the receptacle, and the bracts have a prominent midrib, but in other respects it corresponds with this species.

CHÆNACTIS ALPINA (Gray, Syn. Flora, 341).

Chænactis Douglasii var. *alpina* Gray, l. c.

This species is very well defined, as to the high alpine specimens, shows little variation, but it has been confused with perennial forms of *C. Douglasii*. It is characterized by being cæspitose, often forming large mats above timber line, stems not filiform: leaves about 2′ long, with many pinnate, narrowly oblong segments, which are rounded

and often lobed at apex, petiole equaling the blade, younger parts floccose; stems subscapiform, 2–4′ long, erect or ascending, rough, scarcely at all glutinous, little enlarged above; heads large, nearly 1′ high, with broadly linear green but rough scales; pappus oblong to oblong-cuneate, about half the corolla tube, lacerate, glabrous. This is my No. 1232. Watson's specimen from the Uinta Mountains, Utah, is much the same. The plants are perennials with very many long branches which are prostrate. This is close to *C. Nevadensis*.

CHÆNACTIS DOUGLASII var. MONTANA. This includes most of the forms usually referred to the var. *alpina* of Gray. It includes all the forms so referred in the National Herbarium, except Watson's specimen mentioned above, and Patterson's, from Gray's Peak, Colorado. All are perennial; peduncles not scapiform, but plants much reduced in the extreme forms; pubescence less floccose, otherwise much as in the type. This is the usual form of the higher mountains, from 7000° to 9000° alt., and ranges from the Rocky Mountains of Colorado to the Sierras.

RIDDELLIA TAGETINA var. PUMILA.

No. 5474. June 21, 1894, Grand Junction, Colorado, 4400° alt., in gravel, in open places.

Depressed from a thick, branched, woody base; stems flexuous, 4–8′ long; leaves all entire, obovate to oblanceolate, 1′ or less wide and 2–3′ long, villous or rarely woolly; heads never clustered, about 10″ long, very villous; peduncles 2½–4′ long; rays 6″ long, broadly oblong; pappus oblong, truncate to erose, ½ the smooth angled, sulcate akene.

This grows on gravelly and high banks of the Grand River, in very dry situations. It was also collected by Miss Eastwood in the same locality before I found it.

Encelia nudicaulis Gray.
Helianthella nudicaulis Gray.
No. 5069k. April 17, near Horse Spring, Arizona, 2500° alt., in compact clay, on a bare and rather alkaline knoll, in poor soil.

No. 5376. June 2, Marysvale, Utah, on loose talus, in very dry and hot places, volcanic soil, 6500° alt.

No. 5095ak. April 23, top of grade, four miles above Pagumpa, Arizona, on barren clay slope, in juniper belt.

An examination of the type specimen of this species shows that it is not the same as *E. argophylla*. All the specimens described by me in Zoe, iii, 304, belong to this species, apparently, or else there are two species included in this one. It is very probable that this will prove to be an exceedingly variable species, having a wide range. The northern plants which I have described in Zoe have a very different habitat, since they grow on dry and rocky ridges, in very exposed situations, where the soil is free from alkali. On the other hand, all the specimens given above under this species flourish in an alkaline, clayey soil, where no other plants will grow. The allied species, *E. argophylla*, I have never seen anywhere except in very salty soil, along the salt deposits of eastern Nevada, in the Larrea belt. It appears that it is never found growing in any other situations.

An examination of nearly all the species of *Encelia* shows that the character of wingless akenes separating this from *Verbesina* is not good, as several species, such as *E. eriophylla*, *E. viscida*, etc., have corky wings. In *E. nutans* Eastwood, which is probably the same as, or a variety of, *Verbesina scaposa* Jones, though rayless, the outer disk akenes are triquetrous and winged, and doubtless represent ray flowers; the species was, therefore, properly placed in that genus with winged akenes, though the habit is that of *Encelia*.

I can see no resemblance in this group of plants to *Helianthella* proper, but there is a strong likeness to *Encelia;* in addition, the former genus is confined to the cold mountains at high altitudes, while the latter is confined to the dry and very hot regions at low elevations, or when the elevations are above 5000° it is due to isolated peaks or ridges in hot regions. To put this plant and its congeners into *Helianthella* does violence to their generic relationship as well as habitat.

Encelia argophylla (Eaton) Gray. *Tithonia argophylla* Eaton, Bot. King Exp.

No. 5032q, April 10, 1894, at salt mine, in hard alkaline clay, 10 miles above Stone's Ferry, Nevada, 1200° alt.

This appears to be exactly like the type of the species. The scales seldom exceed the disk, ovate acuminate; akenes very villous, cuneate-oblong, wings narrow, awns stout and nearly as long as the corolla tube; rays about 1′ long, 1–2″ wide, hairy externally like all the other species of this group; ray akenes abortive, triquetrous with or without pappus (this character also belongs to the group); stems very thick and tufted, branched and very short, woody, densely covered with the very thick leaves; peduncles scape-like from the crown of the leaves, 2° long.

ENCELIA GRANDIFLORA. *Helianthella argophylla* Coville, Death Valley Rep., p. 132, not Gray, Proc. A. A. xix, 9.

This differs from the above in the glabrous or barely pubescent not villous akene, which is deltoid, 3″ long by 2″ wide, with wing conspicuously developed and minute awns; bracts lanceolate, long-acuminate, longer than the disk, often 6″ longer; rays 4″ wide and 2′ long, heads with the rays 5′ wide. This is a much larger plant than

E. argophylla, and differs in seemingly good characters.

LAPHAMIA PALMERI var. TENELLA.

No. 5249aa. May 16, 1894, Springdale, Utah, 4000° alt., in crevices of sandstone rocks.

Stems and petioles filiform; leaves all alternate, doubly and coarsely dentate, thin; whole plant sparsely floccose-villous, even to the head; otherwise much as the type. This plant grows on rocks in delicate tufts, about 6′ long, the stems are weakly, and ascending or pendent.

LAPHAMIA CONGESTA.

About 6′ high, in dense tufts from woody base, stems branched above and branches 2–3′ long and crowned by the solitary head whose proper peduncle is 1′ or less long; leaves all alternate, lanceolate to broadly ovate, all with a cuneate base, petiole equaling or half shorter than blade, 2–6″ long exclusive of the petiole, not veiny, entire or in the forms with larger leaves coarsely few-dentate, acutish; stems terete, slender; whole plant very rough-scabrous; heads campanulate, about 3″ high, 15–20 flowered, cream-colored, rayless; scales narrowly oblong to nearly linear, about 12, acute; akenes very scabrous throughout, with one slender awn, nearly equaling the akene. Whether this and *L. tenella*, which is also rayless, vary into *L. Palmeri* can only be conjectured. If the leaf characters hold they are certainly good species.

No. 6063. September 21, 1894, in clefts of rocks on the mesa below the Buckskin Mountains, Arizona. 7000° alt.

LAPHAMIA GRACILIS.

No. 6050c. September 15, 1894, below Nagle's Ranch, on edge of Buckskin Mountains, Arizona, in crevices of limestone rocks, at 7000° alt., in very dry places.

Slender from a shrubby base, hanging in festoons from overhanging rocks, 6–12′ long, weak, ashy: leaves

pedately lobed and lobes oblong, rarely again toothed, blades 6″ or less long, all on a slender petiole about half their length, and obtuse or barely acute, alternate, thin; plants racemosely branched above with solitary heads on slender peduncles, 2′ or less long; flowers light yellow, few, in small heads, 2″ long and 2″ wide, flowers and scales pubescent; akenes with thick lateral nerves and usually a slender awn at each angle, narrowly oblong, scabrous pubescent.

Senecio Bigelovii Gray. I can find no crucial character separating this from *S. Rusbyi* Greene.

CNICUS CLAVATUS.

No. 5715. August 2, Fish Lake, Utah, 10,000° alt., in gravel.

Plants tufted from a deep perennial root, erect, 2–2½° high, glabrous throughout; leaves lanceolate, root leaves about 1° long, stem leaves 6–8′ long, all deeply pinnatifid with lanceolate, very shortly spinose lobes, spines 1″ long or less; leaves percurrent by a narrow wing (3′ high) below the petiole; heads on peduncles 2′ long, involucrate with several leafy bracts; scales imbricated, coriaceous except at tips of the innermost, all but the uppermost spinose with short spines, and these also with lateral spines; bracts imbricated, the outer somewhat shorter, the upper all with dark tips; flowers white, corolla lobes ⅓ the tube; at least some of the pappus awns clavate thickened at the apex in each flower, short, barely exceeding the corolla tube; heads 2′ high, nearly hemisperical to campanulate. This grows at high elevations close to snow, in the same situations in which *C. Eatoni* is found, but it is conspicuously different from that species.

CNICUS CALCAREUS.

No. 5695bh. July 27, Bromide Pass, Henry Mountains, Utah, 10,000° alt., in gravel.

No. 5696. July 30, Cainville, Utah, 4000° alt., in clay. Glabrous throughout except some floccose wool on the lower bracts, involucral scales scabrous; stems tufted from a thick perennial root, with the habit of *C. Eatoni*, 2° high, erect, stout, somewhat branched above; leaves 8–12′ long and 10–15″ wide, running down on the stem nearly the length of the node, pinnatifid into triangular or oblong lobes, which are short and stout-spinose at tip and minutely so on the margin; heads sessile or nearly so, about 1½′ long, turbinate-cylindrical, purple flowered; scales regularly imbricated and outer gradually shorter, thin, inner subulate-acuminate, very acute, but not prickly, outermost scales ovate, tapering into a short erect awn; anther tips apiculate: corolla about equaling the lobe: all the scales have a dark line in the middle, are not closely appressed nor rigid; the plants are very leafy throughout, with heads 1–3 in a cluster, which is sessile or nearly so.

This grows on alkaline clay soil, above Cainville, along the Fremont River.

If the published characters for other species of this genus hold, then all these here described are good species, but I fear that many recognized species will eventually prove to be forms of polymorphous species, into which some of these may fall.

CNICUS NIDULUS.

No. 5290a. May 25, Pahria, Utah, in red sand along the river bed, 5000° alt.

Erect from a thick woody, perennial root, 2° high, floccose-woolly throughout, except the nearly glabrous, seemingly viscid scales; leaves lanceolate, pinnatifid with triangular lobes, which are very stout-spiny; spines yellow, 6″ long; heads ovate, 10″ long; scales coriaceous, regularly imbricated and close-pressed, without green tips,

outer ovate to lanceolate, the body short, but tipped with a very stout and long, yellow, roundish spine, 1′ long, or equaling the head, the inner scales with shorter spines and the innermost series of delicate, linear, subulate, thin, red-tipped scales, shorter than the outer spines; corollas not developed. This species is very striking and seemingly different from any other. It grows in red, alkaline sand, along the bottoms of the Pahria river, at Pahria, Arizona.

Crepis occidentalis Nutt.

No. 5568h. July 2, Provo, Utah, 6500° alt., in gravel.

No. 5455e. June 18, two miles north of Ferron, Utah, on clay, 5500° alt.

No. 5432. June 15, Ireland's Ranch, in Salina Cañon, Utah, 8000° alt., in gravel.

This differs from the type in having only 8 scales to the involucre, and tends to break down the distinction between this and the allied species.

Nemacladus ramosissimus Nutt.

No. 5077ae. April 19, at spring, 15 miles above Pierce's Spring, Arizona, 1700° alt., in sand.

No. 5045u. April 15, Mica Spring, Nevada, 4000° alt., in gravel.

This is *N. capillaris* Greene, but I can find no valid characters on which to separate the two species.

PRIMULA INCANA.

No. 5312av. May 29, Beaver Coöp ranch, at the head of the South Fork of the East Fork of the Sevier river, 7000[c] alt., in cold bogs. A very early bloomer.

Plants erect and single from fleshy or fleshy-thickened roots, no tap root, 6′ high, simple, scapose; root-leaves rosulate, oval to elliptical-oblong, obtuse, rounded, minutely-denticulate, 1–2′ long, without petioles, gree n above, whole plant otherwise white-farinose except the

corolla; scapes rather stout for the plant; capitate heads of flowers subtended by obtuse, narrowly-oblong bracts, 2–3″ long; flowers sessile or nearly so, 8 or more, in a dense head; calyx narrowly-oblong, the lobes rounded and obtuse; corolla purple, the tube barely surpassing the calyx; lobes about 1″ long, throat yellow. This species seems to be nearest to *P. farinosa*, and may be only a form of it, but it seems distinct.

FRAXINUS ANOMALA var. TRIPHYLLA.

No. 5082w. April 20, Pagumpa, Arizona, in the Grand Wash, 4000° alt., among rocks, at the lower edge of the juniper belt.

Leaflets 3 and stalked.

GENTIANA TORTUOSA.

No. 6008. September 7, 1894, Panguitch Lake, Utah, 8400° alt., in meadows.

Prostrate from an annual root, tortuous stems rather slender and entangled, 2–6′ long; leaves linear-lanceolate and acuminate, 2′ long, little reduced above; plants floriferous from base to apex; peduncles slender, 1¼′ or less long, tortuous, often deflexed in fruit; flowers several to each node, white, 3–4″ long, oblong-campanulate; lobes elliptical, acutish, nearly as long as the tube; fringe reduced to scattered setæ on the base of the lobes; anthers nearly round, extrorse; capsules short-stipitate, as long as the calyx, oblong; seeds oval, ½″ long, smooth and coat very close, yellowish; calyx tube almost none, lobes linear, 2–3″ long, rather unequal, nearly equaling the corolla or 1½″ shorter.

This delicate little plant is near to *G. Amarella* and grows in similar situations in gravelly meadows.

Apocynum androsæmifolium var. *pumilum* Gray.

No. 5684ak. July 25, Mt. Ellen Park, Henry Mts., Utah, 9400° alt., in volcanic gravel, on open slopes.

No. 5560. July 2, Provo, Utah, in gravel, 6500° alt., among oak brush on mountain sides.

Plants erect; branches widely spreading, 2° long; leaves elliptical-ovate, 2′ long, 1′ wide; flowers many, cymose-panicled at the ends of the branches, purple, campanulate, 2½″ long; calyx lobes triangular, acute; corolla lobes triangular, 1″ long. This is intermediate between *A. cannabinum* and *A. androsæmifolium*. It is the only form of this species which I have seen in the West. It grows in more open places along roadsides in the mountains, but never grows in meadows or in moist places frequented by *A. cannabinum*, nor can it be a hybrid with that species. This seems to be *A. floribundum* Greene, Erythea, i, 151.

ASCLEPIAS LABRIFORMIS.

No. 5650. July 19, 1894, Capitol Wash, near the Henry Mts., Utah, 5000° alt., in sandy gulch.

Erect, glabrous except the floccose-woolly pedicels; leaves thick and leathery and all but the lowermost alternate, all short-petioled, the petiole being 3″ long, leaves lanceolate and tapering from the base to the shortly-acute apex, 1–3″ wide, 3–5′ long, overtopping the short-peduncled umbels (peduncle 6″ long), umbel with many filiform bracts; pedicels about 9″ long, slender, about 20; calyx green, lobes ovate to elliptical, 1″ long; corolla lobes oval, white, 2″ long; column ½″ long; hoods oblong, truncate, greenish white, with a green midrib, just equalling the anther tube; horns much exserted, touching or overlapping in the center; anther wings very broad at base and truncate, then quickly narrowing above; pods on recurved pedicels, mostly erect, glabrous, ovate-oblong, taper-pointed, 15–20″ long.

Phacelia glechomæfolia Gray, *P. perityloides* Coville in Death Valley Rep. Mr. Coville's plants seem to be identical with Gray's.

PECTOCARYA LINEARIS var. PENICILLATA (H. & A. Bot. Beechy, 371).

Pectocarya penicillata H. & A., l. c.

The constant recurrence of intermediate forms makes it no longer possible to keep up this as a distinct species. Among other intermediate forms is one from Wilcox from Idaho in the National Herbarium.

Pectocarya setosa Gray. The nutlets are described as equally divergent, but they are not; they are geminate. In *P. pusilla* they are equally divergent in my specimens.

KRYNITZKIA ECHINOIDES.

No. 5297p. May 26, 1894, Pahria Cañon, Utah, 5300' alt., in red sand.

No. 5312ac. May 28, 1894, Cannonville, Utah, 6000 alt., on clay slopes.

This is a cæspitose perennial, 6′ high, with erect stem, and is very fulvous, except the lowest leaves; pubescence of the leaves close, short, dense, appressed, upper stem and calyx very setose with spreading hairs; corolla white or cream-colored, usually 1–2″ longer than the nearly filiform calyx lobes, which are 3–4″ long, corolla lobes rounded, rotate, short, about 1½″ long; nutlets sharp-angled, wingless, muricate, corrugated, papillose, and short-setose on the backs and sides. This is very close to *K. fulvocanescens*, to which some specimens have been referred. The synonymy of this species is very much confused, the original *Eritrichium fulvocanescens* of Gray in Herb. based on Fendler's specimen from New Mexico is *K. echinoides*, though the specimen is only in flower. Watson, in King's Report, took up the name of Gray for a Utah plant, and erroneously referred Fendler's plant to it, but the specimen on which Watson's description and figure were founded is now in the National Herbarium, and is clearly a low altitude variety of *K. sericea* (Gray) *i. e.*

var. FULVOCANESCENS (Wats.), being scarcely at all fulvous, and the fruit with warty (never acute) corrugations and intermediate papillæ, and the short edge of *K. glomerata*, the nutlets are not carinate, but are somewhat convex on the back and abruptly narrowed towards the rounded apex. The nutlets do not fall off in any species of this group and are pediceled below. My No. 5163ac is almost exactly this variety.

KRYNITZKIA LEUCOPHÆA var. ALATA.

No. 5289t. May 23, 1894, Johnson, Utah, 5000° alt., on sandstone cliffs.

No. 5261j. May 17, 1894, Springdale, Utah, 4000° alt., in red sand, or gravel.

No. 5455c. June 18, 1894, two miles north of Ferron, Utah, in clay, 5700° alt.

No. 5144. May 3, 1894, Silver Reef, Utah, 4500° alt., on sandstone cliffs.

Nutlets bordered by a thick, entire, narrow, raised wing.

To this I refer No. 632, Fendler and M. M. Palmer's specimen from Fort Defiance, New Mexico.

Echinospermum floribundum Lehm. Dr. Gray upholds Greene's *E. ursinum* from Northern Arizona and adjacent Utah, but I fail to find any character which is permanent, even in Greene's duplicate type in the National Herbarium the characters do not hold.

Polemonium cæruleum L.

No. 5441ac. June 15, 1894, Ireland's Ranch, Salina Cañon, Utah, 8000° alt., in gravel, along shaded streams, in springy places. This is *P. filicinum* Greene. I have never been able to see any valid character separating this species from *P. foliosissimum* Gray. If the flowers are light colored then it is the one species, if not it is the other, the leaf and floral characters vary.

Phlox longifolia var. *brevifolia* Gray.

No. 5098j. April 23, 1895, ten miles south of Black Rock Spring, Arizona, in gravel, in the juniper belt, 4500′ alt. No. 5286v. May 23, 1895, Kanab, Utah, 5300′ alt., in red sand. These forms have linear-oblong, obtusish leaves, 1′ or less; the calyx has long and hyaline interspaces greatly enlarged, and folded outward so as to make the calyx seem ovate at base. The replication of the calyx is a character of no permanent value.

PHLOX LONGIFOLIA var. GLADIFORMIS.

No. 5208c. May 11, 1894, Cedar City, Utah, 6500 alt., in gravel, on slopes.

This has the habit of *P. Douglasii*, but is less compact: leaves densely clustered around the sessile flowers, loosely imbricated below, or the nodes 3″ long, leaves about 1½′ long, all subulate-lanceolate, pungently acute, thick and stiff, midrib and margins prominent, the latter a little involute; whole plant, even to the flower, glandular and sparsely floccose-hairy, but green; calyx lobes a little over half the tube; corolla tube nearly double the calyx, lobes oval, entire. The plants are loosely cæspitose, and would seem to be hybrids between *longifolia* and *Douglasii*, were it not for the fact that they are very abundant in the locality where found. It grows on north slopes of gravelly hills at the mouth of the cañon of Cedar Creek.

There seems to be a complete transition from *P. longifolia* to *P. Douglasii* through the above variety and the var. *brevifolia*.

Phlox austromontana Coville seems to deviate in no constant character from *P. Douglasii*, the replication of the calyx relied upon as a crucial character, proves of no value, as it varies from nothing to a wide fold. I cannot refer this to *P. speciosa*, as Gray has done.

GILIA CONGESTA var. PANICULATA.

No. 5464m. June 19. 1894, Huntington, Utah, in clay soil, 6000° alt.

Densely floccose pubescent, with many small heads in a rounded panicle and very much branched above, 6–12′ high.

GILIA McVICKERÆ.

No. 5378. June 2, 1894, Marysvale, Utah, in gravel, on arid slopes, 7000° alt.

No. 5972g. August 31, 1894, Marysvale, Utah, in loose gravel, 6500° alt.

No. 5989m. September 4, 1894, Circle Valley Cañon, 7000° alt., in gravel.

This belongs to the section *Giliandra*, biennial, erect, 2–2½° high, branched above into a very wide, open, corymbose panicle, which is often 2° across, and sometimes practically flat-topped; all the upper leaves are reduced to arcuate bracts, the root leave and lower stem leaves are pinnatifid with oblong, entire, rounded, acutish lobes, leaves 2–3′ long; glabrous throughout, except the glandular, campanulate, very short pediceled calyx; calyx tube about 1″ long, the blunt lobes minute; corolla about 6″ long, sky blue, tube 3–5″ long, rather ampliate above and campanulate, with oval lobes, which are 1½″ long and surpass the widened upper tube, and are rotate-spreading; filaments long-exserted, double the tube, blue, crowned with oval, minute anthers, filaments spreading. This plant has the habit of very robust forms of *G. latiflora* and *G. inconspicua*. It is a very beautiful plant, and was first discovered some ten years ago by Miss Kelley, now Mrs. McVicker, of Salt Lake City, at Panguitch Lake, Utah. Her specimen was without the root leaves. I sent a portion of it to Dr. Gray with the manuscript name. He also regarded it as a new species, but thought it might

prove to be a form of *G. pinnatifida*. In view of the imperfection of the original specimen, I thought best to leave it unpublished till better material could be collected. Abundant material is now at hand, and I take pleasure in dedicating this species to its discoverer. This grows on very hot and dry talus and even on cliffs.

GILIA FLORIBUNDA var. ARIDA.

No. 5701a. July 31, 1894, Capitol Wash, Utah, near the Henry Mountains, 5000° alt., on sandstone rocks, in very arid places.

This plant has the habit of *G. Watsoni*, but is nearest to *G. floribunda*; whole plant greenish, but rough, with short, stiff, not dense pubescence throughout; tufted in dense bunches and branched below, stems 2–4′ long, terminated by a dense head of sessile flowers, 5–10 in the head; stems white; leaves pedately 3–5 parted, filiform, rigid, straight, acerose, involute, 1-nerved, 5–6″ long, somewhat longer than the internodes, not reduced above, and heads with similar bracts; nodes enlarged; calyx cylindrical, tube 3″ long and lobe 1″ long, very hyaline between the angles; corolla white, 1–2″ longer than the calyx, narrowly oblong lobes, 2–2½″ long; seeds 2 in each cell, linear. The heads are seemingly a little glandular and the flowers are vespertine.

This plant grows on the hottest red sandstone rocks in little crevices and pockets, and is quite fragrant.

GILIA LEPTOMERIA var. TRIDENTATA.

No. 5445n. June 16, 1894, near Emery, Utah, in clay, 7000° alt.

Corolla cuneate and tridentate, rotate-spreading, and flowers smaller and shorter than in the type. This is figured by Watson in King's Report along with the type, but when growing it is conspicuously different from it, though often found growing with it.

Gilia scopulorum Jones.

No. 5032l. April 11, 1894, lava ridges, ten miles above Stone's Ferry, Nevada, 1000° alt.

No. 5024ao. April 5, 1894, on divide 12 miles east of Beaverdam, in Nevada, 6000° alt., in gravel.

No. 5029m. Bunkerville, Nevada, April 6, 1894, 1550° alt., in gravel.

No. 5029k. Same date and locality.

No. 5110ac. April 26, 1894, St. George, Utah, 3000° alt., in red sand.

No. 5036ah. April 13, 1894, near Hole in the Rock, above Stone's Ferry, Nevada, 1550° alt., in gravel.

No. 5045x. April 13, 1894, Mica Spring, Nevada, 4000° alt., in granitic gravel.

This well marked species, which Dr. Gray has referred to *G. inconspicua*, shows no intergrades in any of my collections for the last fifteen years, and there are no intergrades in the National Herbarium.

LYCIUM TORREYI var. FILIFORME.

No. 5015. April 5, 1894, Beaverdam, Arizona, 1700° alt., in sand.

Leaves spatulate-linear, small, 9″ or less long; flowers on filiform pedicels 9″ or less long.

PENTSTEMON ACUMINATUS var. CONGESTUS.

No. 5262. May 19, 1894, near Canaan Ranch, Utah, 5000° alt., in sand.

No. 5467c. June 20, 1894, Price, Utah, in clay soil, 5500° alt.

No. 5441ai. June 15, 1894, Ireland's Ranch, in Salina Cañon, 8000° alt., in gravel.

Strict, erect, 2° high; spikes simple, long, dense, linear; leaves large, oblong, mostly rounded and obtuse; sepals ovate to oval, acutish, scarious-margined; flowers 8″ long, blue; sterile filament densely long-hairy; corolla

hairy within; anthers glabrous. This seems to differ from *P. Parryi* chiefly in the blue flowers.

P. acuminatus Douglas is a plant of the northwest ranging through the Great Basin, while the plant of the plains (*P. Fendleri* Gray) is certainly as distinct as most of the reputed species.

P. confusus Jones connects *acuminatus* and *Parryi* and may run into one or the other. *P. Wrightii* Gray, which is the same as *P. Utahensis* Eastwood, seems sufficiently distinct, but these with *P. puniceus* form a very closely related group.

PENTSTEMON EATONI var. UNDOSUS.

No. 5110ah. April 26, 1894, in red sand at St. George, Utah, 2700° alt.

No. 5289u. May 23, 1894, Johnson, Utah, 5000° alt., in red sand, among junipers.

Scabrous or short-pubescent, except the flowers and uppermost stems; lower stem leaves 3–5′ long, narrowly oblong, 1½′ wide, wavy on the margin.

This was also collected by Capt. Bishop in the same region in 1872. It grows among the junipers in gravelly soil throughout northern Arizona along the Colorado River and into Utah as far as the rim of the Great Basin.

PENTSTEMON CONFERTUS var. ABERRANS.

No. 5601i. July 6, 1894, Soldier Summit, Utah, 7300° alt., in gravel.

No. 5740. August 4, 1894, Fish Lake, Utah, 9000° alt., in meadows, in gravel.

Flowers about the size of *P. humilis* var. *breviflorus* or a trifle larger and plants with the habit of *P. humilis;* 1° high or less, not glandular, otherwise almost exactly as *P. confertus*. This variety abounds throughout the mountains of central Utah, being more common than any other form. It occurs most frequently in subalpine meadows and shady woods in rich soil.

BUDDLEIA MARRUBIIFOLIA var. UTAHENSIS (Coville, Proc. Biol. Soc. Wash., 7, 69). This seems like a narrow leaved form, as the wider primary leaves are absent in Coville's specimens.

Eriogonum nivale Canby seems to differ in no constant respect from *E. ovalifolium*.

Eriogonum Rusbyi Greene is *E. Jonesii* Watson.

ABRONIA MICRANTHA var. PEDUNCULATA.

No. 5101. April 26, 1894, St. George, Utah, 2700° alt., in red sand.

No. 5482m. June 22, 1894, Green River, Utah, 4500° alt., in clay.

No. 5183t. May 7, 1894, Le Verkin, Utah, in gravel, 3400° alt.

Peduncle double the petiole; fruit often 3-nerved, emarginate at both ends, often very large, 9″ long; flowers small; fruit often red.

This seems like a hybrid with *A. cycloptera*, but the latter is not known in the region. The bracts of both these species are ovate, small, 1–2″ long, abruptly acute or at least acuminate at apex.

ATRIPLEX SUBDECUMBENS.

No. 5745. August 6, 1894, Fish Lake, Utah, 9000° alt., in gravelly meadows.

This species is nearest *A. microcarpa* and *A. argentea*: plants slender, subdecumbent, annual, 2–8′ long, much branched at the base, mealy throughout, leafy throughout; leaves ovate to lanceolate, with a cuneate base, barely petioled, 6–9″ long, rather thin, entire; plants fructiferous throughout in small, sessile clusters; flowers minute, greenish; fruiting bracts 1″ long, rather cuneate-orbicular to obovate, apex crimped and obscurely dentate, or sometimes toothed, green, sides smooth, back nervose to muricate, seldom if ever with green points, bracts united below.

This grows in gravelly, dry patches in meadows, at 9500 feet altitude.

ATRIPLEX GRACILIFLORA.

No. 5697. July 30, 1894, Blue Valley, near Henry Mts., Utah, 4000° alt., in clay.

No. 5656e. July 20, 1894, Cainville, Utah, 4500° alt., in clay.

Annual, racemosely branched throughout and these branches again branched, forming a large tuft 1–2° in diameter, plants about 1° high, inner stems erect and outer ones ascending or spreading, sparingly mealy throughout, the younger parts more so, stems round; leaves all cordate-ovate, 10″ long or less, on a petiole 1″ long, entire, fleshy when fresh and rather thick even when dry; pistillate flowers few, scattered singly among the upper leaves; staminate flowers in a slender, dichotomous, bractless panicle, yellowish, in heads of 5 or more at the ends of short pedicel-like branchlets 1–2″ long, the main branches of the panicle 2–4′ long; flowers minute; fruit on a stalk 3″ long, bracts united except at the top and produced down the stalk to within ½″ of the base in a broad wing, also extended on all sides of the fruit into a green wing which is barely sinuous above, this wing is 2″ wide on the sides and 1″ wide at the apex of the fruit, fruit 5–8″ wide, orbicular to reniform, not warty nor appendaged, the body of the fruit is ovate to elliptical, 1″ wide and 2″ long, closely invested by the bracts which are separate only at the apex. This remarkable plant must rank near to the shrubby *A. canescens* in the fruit character, though so unlike it in all other respects.

This grows in alkaline soil on the flats bordering the Fremont River, where the soil is a very compact clay during the growing season.

ATRIPLEX CORNUTA.

No. 5481. June 22, 1894, Green River, Utah, 4500° alt., in clay.

This has much the habit of *A. graciliflora*, annual, branched chiefly below, erect, 6–12′ high, very mealy and whitish, stems round; leaves ovate to deltoid with all three angles sharp when deltoid, often cordate, 1′ long or less, thick, petioles 1″ long; pistillate flowers in clusters of 1–3 in the lower axils, in fruit all on pedicels 2–3″ long and often pendent; staminate flowers in small, sessile clusters in simple, terminal, leafy racemes, reddish-white; fruit forming a ball 2–3″ in diameter by the innumerable horns or corrugated and lobed processes which cover the bracts completely and equal their bract lobes.

This frequents the same alkaline clayey soil as *A. graciliflora*.

ERIOGONUM AUREUM.

No. 6091. September 28, 1894, St. George, Utah, 2700° alt., in sand.

This is an intricately branched shrub, 1–3° high, widely branched and stout, with rounded top; the stems are rather short, and quite leafy to the base of the short peduncle; leaves elliptical, shortly contracted into a petiole 2–6″ long, the whole leaf being 12–20″ long, densely woolly below and much greener above, entire; peduncles 1–2½′ long, then trichotomously and repeatedly branched, not angled, branchlets short; bracts all subulate and 1–2″ long, but the upper ones minute; involucres and uppermost divisions appearing glabrous, but really minutely and sparsely woolly; involucres oblong, 1″ long, divided about ⅓ the way into rounded, obtuse, erect lobes; flowers golden, 1″ long, outer lobes oval, obtuse, inner lobes oblong, with a green midrib, lobes widely spreading; flowers with a nipple-like projection at the base and involucres rounded, not angled; the pedicels are exserted.

This is very close to *E. corymbosum* and *E. Thomsonæ*.

To this species I would refer two specimens collected by Rusby at Holbrook, Arizona, as var. *glutinosum*, being glutinous above; having oblong, crenate leaves, 2′ long; involucre somewhat angled; flowers smaller.

To this species I would refer as var. *ambiguum*, No. 1688, Coville, collected on the east slope of the Sierras, Inyo County, California, having narrow and entire leaves, peduncles 4–6′ long, small clusters of flowers and only secondary and very short rays, the involucres much angled and flowers very short, ½″ long.

ERIOGONUM RENIFORME var. COMOSUM.

No. 5036a0. April 12, 1894, near Hole in the Rock, 10 miles above Stone's Ferry, Nevada, in gravel, 1500˜ alt.

No. 5036bj. April 12, 1894, 10 miles below Mica Spring, Nevada, in gravel, 2000° alt.

Annual, 3–6′ high; leaves radical, 10″ long, and with a slender petiole 1′ long, the blade round or somewhat oblate, truncate to cordate at base, and fully developed ones emarginate at the apex; the younger leaves are very white, with long, comose, tangled hairs, the upper side less so or even green; inflorescence trichotomously branched, mostly at the very base of the stem; small bracts at least woolly within and with hyaline margins; involucres erect on pedicels 1′ long or less, over 1″ high, hemispherical, glaucous, with very short hyaline teeth; flowers very small and exserted, ½″ long, pubescent with rough, flat, short, scale-like hairs; flowers reddish or greenish yellow, outer lobes elliptical, inner lanceolate and barely acute; stems and pedicels glabrous and flowers many in each involucre.

This is readily separable from *E. Thurberi* by the leaves and flowers and the more open and slender habit; it is

easily separable from *E. reniforme* by the pubescent flowers.

ERIOGONUM LONGILOBUM.

No. 5590j. July 5, 1894, near Price, Utah, in clay, 6000° alt.

Densely cæspitose in large perennial mats, very woolly-hairy throughout, except the glabrous tips of the flowers; leaves broadly oblanceolate, all on a petiole nearly as long as the blade, 1–2′ long, thick, margins inclined to be revolute or at least the leaf convex, obtuse; peduncle scapose, 1–2′ long, with 3–5 sessile involucres in a dense head; involucres parted nearly to the base, lobes 2″ long, leaf-like, triangular, erect, equaling the flowers; flowers abruptly contracted and with a minute prolongation above the joints; pedicels 1″ long, but the flowers seem to be sessile; lobes of the flowers obovate-oblong, rounded, barely erose, yellow, with darker or green midrid, often tinged with red, barely 1½″ long; heads not bracteate; akenes very woolly. This appears nearest to *E. villiflorum*, but somewhat resembles *E. ovalifolium* in habit and leaves.

RUMEX SUBALPINA.

No. 5957. August 29, 1894, Brigham Peak, near Marysvale, Utah, 10,500° alt., in gravel, in the bed of a subalpine stream.

No. 5893ai. August 23, 1894, near the head of Bullion Creek, above Marysvale, Utah, 11,000° alt., in gravelly soil, along the bed of a subalpine stream.

Erect in large clumps, 3–5° high, smooth throughout, stems 1′ thick or less, coarsely sulcate; root leaves 1° or less long, 2–5′ wide, on petioles nearly as long, oblong-lanceolate, smooth, entire, truncate at base or abruptly contracted, hardly acute at apex, petiole stout and margin-less, stem leaves similar but narrower, uppermost often

linear, none of the leaves at all sheathing, panicle narrow, 1–2° long, branches appressed, densely flowered; flowers on filiform pedicels 4–6″ long, pendent; fruit wings without tubercles, triangular to deltoid, 2–3″ long, coarsely reticulated, sometimes rhombic, but in that case always with a contracted slightly produced apex, always fimbriate toothed below, and in the broader-winged forms very conspicuously so nearly to the apex.

This grows in cold, gravelly, springy places along subalpine streams, at from 10,000 to 11,000 feet altitude, along with *Oxyria digyna*, *Polygonum bistorta* and *Aquilegia cærulea*.

CROTON LONGIPES.

No. 5213. May 12, 1894, two miles east of Leeds, Utah, in sand, at 3500° alt.

No. 5024au. April 5, 1894, west side of Copper Mine, in Beaverdam Mountains, Nevada, 3000° alt., in gravel.

No. 5149am. May 3, 1894, Silver Reef, Utah, in sand, at 3500° alt.

Shrubby at base, erect or ascending, 1–2° high, slender, freely branched, stems white-stellate, leaves oblong-elliptical, apiculate, obtuse, rounded or short-cuneate at base, 1′ long, on petioles nearly as long, densely or sparsely stellate below, often glabrous above; flowers in very short, umbellate racemes, on long, slender pedicels, 2–3″ long; staminate flowers many, 1″ wide, with triangular lobes; fertile flowers with pedicels subtended by linear bracts; bracts as long or longer than the pedicels; calyx of the pistillate flowers similar to that of the staminate ones, but nearly 3″ wide; fruit nearly round, 1″ long, densely white-stellate. This can neither be placed with *C. Californicus*, *C. gracilis* nor *C. Neo-Mexicanus*, though it is related to them all. It is nearest *C. corymbulosus*, but the flowers are smaller, the calyx lobes very different,

the styles very short, the leaves different, staminate flowers long-pediceled, pistillate less so and erect, not reflexed. In *C. corymbulosus* the calyx lobes are oblong to obovate and shortly acute, fruit reflexed, flowers large, styles long, leaves acute and generally ovate, and nearly equally white-lepidote.

This abounds in sandy places, especially on drifting sand dunes in the valley of the Virgen and southward.

COMANDRA UMBELLATA var. PALLIDA (A. DC. Prod. 14, 636).

Comandra pallida A. DC., l. c.

There is no constant character separating this from the type that I can discover.

TRIGLOCHIN MARITIMUM var. DEBILE.

No. 5289. May 23, 1894, Johnson, Utah, 5000′ alt., in alkaline clay.

Flowers simply racemose on the slender, weak stems, which are 6–12′ high; roots very thick; leaves all radical and short. This plant is much smaller than *T. palustre*, but in the character of the flowers and fruit certainly belongs to *T. maritimum*. Watson's *T. palustre* of King's Report is a taller form of the same.

This grows on clayey alkaline flats at Johnson, Utah, where no other plant will grow.

CALAMAGROSTIS SCOPULORUM. Densely tufted, about 2′ high, erect, stems slender; leaves about a foot long, coarse, prominently striate-nerved, 3″ wide, flat, tapering to a slender point, very light colored as if glaucous, glabrous throughout except the nerves upwardly are very scabrous; ligule scabrous, 2″ long, entire and truncate to lacerate; inflorescence spicate, broadly linear 4–6′ long and about equaling the uppermost narrow leaf, 6″ to 1′ broad, occasionally a little lax, usually strict and dense; spikelets nearly white, appressed; rays about five, the in-

ner ones 1′ or more long and the outer very short, pubescent with ascending short hairs, the nodes in the lower part of the spike about 9″ apart; spikelets about 2″ long, lower glumes spreading in flower, equal, the lower 1-nerved and nerve very prominent and green, ovate-lanceolate, simply acute, glabrous and hyaline except the very scabrous nerve, usually; upper glume the same but with two additional nerves extending only to the middle, occasionally these are wanting; palet barely shorter than the others, 2-toothed, lanceolate, very faintly 2-nerved, glabrous, simply acute, like the others very thin and hyaline; floral glume ovate-lanceolate, 4-toothed at apex, faintly 4-nerved, scabrous throughout, equaling the palet; awn attached below the middle, straight, shorter than the glume; hairs ⅔ the palet, sparse. This is manifestly allied to *C. sylvatica*.

No. 6075. September 25, 1894, Springdale, Utah, growing in clumps at the base of sandstone cliffs along the Virgen river, 4000° alt.

Poa festucoides. Tufted like *Festuca ovina*, perennial, erect 2–3° high, slender, minutely upwardly scabrous throughout except the spikelets; root leaves clustered and with enlarged short sheaths, the blade 3–5′ long, involute-filiform and tapering to a point, stem leaves similar but a little longer, sheaths half the internodes which are a foot or less long; ligules usually 2″ long and lacerate at top; panicle on a peduncle as long as the upper leaf, 4–6′ long and rachis as much more; rays single about 1½′ apart, filiform, widely spreading, proper ray 1′ long and half its prolongation as a rachis; raylets single, racemose, 3–4, 1′ or less long, branched above the lower ⅓, bearing 2–3 narrowly elliptical spikelets which are 4–5″ long, 1–1½″ wide, with about 5 florets, spikelets widely spreading and pendulous, all pediceled; lower glume 1-

nerved narrowly elliptical, acute, somewhat keeled, hyaline, 2″ long, nearly glabrous; upper glume 2½″ long, elliptical, barely acute, rounded, nearly smooth; flowering glume with two evident marginal nerves, two very faint additional inner ones, and three others which are visible only at the top, the midnerve being obsolete except at the very tip, oblong-lanceolate, with a short-acuminate tip, scabrous above and hyaline, but on the sides hyaline border very narrow, 3″ long, rounded; palet concave in center, with two green nerves, acute, nearly linear, equaling the flowering glume, hyaline; rachis of the spikelet with joints about 1″ apart, pubescent; spikelets somewhat flattened.

No. 5671. July 25, 1894, Mt. Ellen, Henry Mts., Utah, 10,000° alt., on open slopes, forming a very conspicuous and important part of the vegetation.

STIPE PINETORUM. Close to *S. Sibirica* Watson, Bot. Cal. Allied to *S. comata*. Densely tufted like *Bouteloua oligostachya* and *Aristida purpurea*, perennial, about 1° high, erect; root leaves 2–3′ long, filiform-involute, sheaths 6–12″ long thickened, brown; ligule obsolete; small wiry stems with about 3 leaves whose sheaths are longer than the internodes, 3–4′ long, with a very short filiform blade 1–2′ long; panicle linear, 6′ long or less, barely exserted; rays 2–3, appressed, the lateral ones almost none, the central one 3–6″ long and 2–3 flowered; lower glume 3-nerved, subulate, tapering into a thread-like tip, 4″ long, smooth; upper glume 1-nerved and narrower and as long, smooth; flowering glume 2½″ long, linear, pungent at base and sparsely long hairy, hairs denser above forming a tuft 2″ long; awn slightly twice-geniculate, 6–9″ long, glabrous.

No. 6023p. September 8, 1894, Panguitch Lake, Utah, 8400′ alt., growing in open places among the pine forests.

STIPA ARIDA. With the habit and general appearance of *S. viridula*, also leaves and ligules; sheaths as long or longer than the internodes; rays in fives below, very short or almost none, appressed, with 3–4 spikelets, filiform, the whole, exclusive of the awns, being 1′ or less long; outer glume lanceolate-acuminate, 4″ long, very thin and hyaline, 3-nerved; inner glume 3″ long, narrower and acuminate, 3-nerved; flowering glume 2″ long, fusiform, very narrow, glabrous above and shortly-pubescent below; awn 2–3′ long, thread-like, flexuous but hardly geniculate, smooth; panicle 6′ long, hardly exserted, dense, wand-like.

No. 5377. Marysvale, Utah, on very dry talus slopes in shingle, 6000° alt., June 4, 1894.

ELYMUS SALINA. With the habit of *Sporobolus airoides*, but culms very different; forming coarse and very close tufts, 1–2° in diameter; stems much thickened below the fibrous leaf-sheaths, perennial, erect, 1–2° high; lower leaf-sheaths loose and somewhat enlarged, very coarsely nerved, nearly smooth, about half as long as the nodes: ligule abortive; leaves pubescent on the under side, especially so at the throat, thick, involute, acute, linear, 4–6′ long (the root leaves), stem leaves 2–4′ long, nodes about 3; inflorescence a simple, loose spike like *Agropyrum glaucum* which it much resembles; spikelets single at each joint, barely contiguous, placed flatwise to the rachis, 6–10; empty glumes 2, subulate, pungent, 2″ long, generally falcate, 1-nerved; spikelet pediceled, pedicel about $\frac{1}{2}$″ long and very thick and stout, often very short: spikelets about 6″ long, 2″ wide and 1″ thick, 7–9-flowered: flowering glume ovate-lanceolate, shortly acuminate, about 4″ long, thick, indistinctly 5-nerved, smooth and rounded, with narrow, hyaline, slightly lacerate margin; palet 2-nerved, concave in the middle and with broad hyaline

margin folded around the stamen, lanceolate, acuminate, bidentate, equaling the flowering glume, joints of the rachis of spikelet about 2″ apart. This remarkable plant has most of the technical characters of Hystrix, but is manifestly allied to *Elymus condensatus*, and may prove to be only a form of it.

No. 5447. Top of Salina Pass, Utah, 8200° alt., in clay, in rather alkaline soil.

EPHEDRA NEVADENSIS var. VIRIDIS (Coville, Death Valley Rep., 220).

Ephedra viridis Coville, l. c.

No. 5213d. May 12, ten miles below Kanarra, 4500° alt., on rocks.

No. 5590e. Head of Soldier Cañon, 6700° alt., in clay, July 5.

No. 5001k. At foot of grade above Bellevue, Utah, 3700° alt., among rocks, March 30.

No. 5163at. Silver Reef, Utah, in gravel, 4500° alt., May 4.

No. 5124. Diamond Valley, Utah, 4500° alt., on rocks, April 28.

No. 5110ao. April 26, St. George, Utah, 3000° alt., in red sand.

No. 5338ah. Marysvale, Utah, 6000° alt., in gravel, May 31.

No. 5297v. Pahria Cañon, Utah, 5300° alt., in red sand, May 26.

No. 5289y. Johnson, Utah, 5000° alt., in red sand, May 23.

No. 5476v. June 21, Grand Junction, Col., 4500° alt., in gravel.

No. 5663bf. Marvine Laccolite, Utah, 6000° alt., in gravel, July 23.

This plant, which I have collected in various places in

Utah and Nevada since 1880, has never seemed to me anything more than the normal form of the species, while the form on which the type *Nevadensis* was based is the less frequent one found in the valleys in less gravelly or clay soil. The variety abounds on sandy or gravelly hills, especially in rocky places and among rocks; it is even found on cliffs. It abounds throughout Utah as far north as the lower end of Salt Lake Valley and westward, and as far eastward as western Colorado.

Cylindrosporium glycyrrhizæ Hark.

No. 5572. July 3, Provo, Utah, in Slate Cañon, 8000° alt.

On *Vicia Americana*.

Spores somewhat smaller than as described, but not otherwise different.

Pleospora Utahensis E. & E.

No. 5902. August 24, Falls of Bullion Creek, Utah, 9500° alt.

On dead stems of *Eupatorium occidentale*. Perithecia scattered, erumpent-superficial, depressed-globose, sparingly fringed around the base with short, coarse, brown hyphæ, finally collapsing above, 150–250 m. diam., with a papilliform ostiolum. Asci oblong, rounded above, 75–90x20–23 m., paraphysate, 8-spored, with only a short rudimentary stipe. Sporidia crowded, biseriate, oblong-elliptical, at first yellow, uniseptate and constricted, then 3-septate, and finally about 7-septate, muriform and dark brown, 20–23x14–16 m.

This differs from *P. Richtophensis* E. & E. in its smaller, more distinctly rumpent perithecia and comparatively broader sporidia, and from *P. alpestris* E. & E. in its 8-spored asci and smaller sporidia.

Puccinia Pentstemonis Peck.

I.

No. 5739. August 4, Fish Lake, Utah, 9000° alt., in meadows.

On *Pentstemon confertus* var. *cæruleo-purpureus*.

No. 5015bg. September 7, Panguitch Lake, Utah, 8400° alt.

Same host.

II.

No. 6015bg.

Same host.

III.

No. 6002ax. September 6, Panguitch Lake, Utah, 8400° alt.

Same host.

No. 6015bg.

Same host, *æcidia* found on No. 5739 and 6015bg are the same as *Æcidium Palmeri* And., and while the teleutospores on No. 6002ax and 6015bg differ slightly from the description given by Peck, they undoubtedly belong to his species. No. 6015bg has the three forms well developed on the same leaves, and as we find no description of the uredo-spores, we make the following:

Puccinia Pentstemonis Peck. Amphigenous. I. Spots and spermagonia wanting; pseudosporidia usually single, but sometimes in small clusters, three or four times as long as broad, and from a much thickened base, which is often bright purple, upper part bright yellow, becoming white at maturity and splitting nearly or quite to the base; spores subglobose or oval, contents granular, epispore thick, slightly echinulate, 18–20x20–22 m. II, III. Sori small, round, scattered, nearly black; uredo-spores in the sori with the teleutospores, globose or oval, smooth. 15–18x18–26 m. Teleutospores broadly oval, somewhat constricted; epispore smooth, slightly but distinctly

thickened at the apex, 27–30x20–22 m; pedicel hyaline, fragile.

UROMYCES LYCHNIDIS T. & E.

No. 5851. August 22, near Tate Mine, above Marysvale, Utah, 9000° alt.

On *Lychnis Drummondii*.

I, II, III on the same leaves. I. Spots indefinite; pseudosporidia hypophyllous, irregularly clustered on discolored areas, short, rupturing irregularly; æcidial spores irregularly rounded, epispores smooth, contents bright yellow, 15–18 m.

II, III, from the same sori; amphigenous, mostly epiphyllous, scattered, irregularly rounded, black or dark brown, bordered by the ruptured epidermis; uredal spores globose, light yellow, minutely echinulate, 12–14 m; teleutal spores ovate, dark brown, epispores not thickened at the apex, longitudinally wrinkled, about 15x20 m; pedicel about equaling the spore, hyaline, very fragile.

Puccinia aberrans Peck.

I.

No. 5064bi. April 14, Mica Spring, Nevada, 4000° alt.

On *Arabis arcuata* var. *perennans*.

No. 5163av. May 4, Silver Reef, Utah, 4000° alt.

On same host.

No. 5165. May 5, Silver Reef, Utah, 4500° alt.

On *Arabis Holbœllii*.

II.

No. 5165.

On same host.

III.

No. 5165.

Same host.

No. 5338ai. May 31, Marysvale, Utah, 6000 alt.

Same host.

No. 5354. June 1, Marysvale, Utah, 7000 alt.
Same host.

The three forms of this species all occur on No. 5165. The æcidial form is the same as *A. monoicum* Peck, and *A. drabæ* T. & E., and as the specific name *aberrans* has priority in publication, it must stand. An examination of the several forms on diffent hosts from nine localities show the following characters:

Puccinia aberrans Peck. I. Hypophyllous; spots none; pseudosporidia often covering the entire lower surface of the leaf, long cylindrical, lacerate at the top, bright yellow; æcidial spores subglobose, smooth, yellow, epispore thick, smooth, 20–28 m. II. In the same sori with the teleutospores; globose, epispore thin, smooth, 28–33 m. III. Usually hypophyllous, but with occasional sori on the upper surface; spots none; sori small, round, sometimes confluent, reddish-brown; teleutospores light colored, oblong, or oblong-clavate, obtuse or round-pointed, much thickened at the apex, constricted, smooth, lower cell very thin-walled, 40–50x20–25 m. Pedicel hyaline, about as long as the spore, quite fragile.

This occurs on *Arabis*, *Draba* and *Smelowskia*.

Puccinia globosipes Peck.

No. 5193. May 8, Le Verkin, Utah, 3000? alt.

II. III.

On *Lycium Andersoni*.

In these specimens the sori occur on both the stems and leaves, and both II and III are found in the same sori. The uredo-spores do not appear to have been collected previously, and are described as follows: II. In the same sori with III. Spores oval or obovate, epispore rather thick, sharply echinulate toward the apex and smooth at the base, 15–20x30–38 m.

UREDO CASTILLEIÆ T. & E.

No. 5651. July 19, Capitol Wash, Utah, 5000° alt.

On *Castilleia affinis.*

Amphigenous; in small, round or oblong sori long, covered by the epidermis; spores oval or globose, reddish brown; epispore finely and distinctly aculeolate, rather thick, contents granular, 20–24x15–18 m.

Synchytrium fulgens Schrœt.

No. 6012. September 12, Panguitch Lake, Utah, 8400° alt.

On *Epilobium adenocaulon.*

This is referred here somewhat doubtfully, as the sporangia are much smaller than in the type, but it does not seem to differ otherwise.

SYNCHYTRIUM CARICIS T. & E.

Amphigenous, in elliptical or oblong clusters forming distinct, reddish brown spots scattered over the entire leaf; sporangia numerous, globose or oval and often angular, light yellow, 12–15x20–25 m.

No. 5867a. August 23, Tate Mine, at the head of Bullion Creek, Utah, 1150° alt., on *Carex Pyrenaica.*

Erysiphe cichoricearum DC.

No. 5988. September 4, Circle Valley Cañon, Utah, 7000° alt.

On *Bigelovia graveolens.*

This form has been so determined by Burrill (N. A. *Pyrenomycetes*, p. 13), but, as he points out, it differs widely from the type in the greater number of sporidia. In these specimens the appendages are slender, delicate and hyaline; the reticulations of the perithecium are very small, the cell wall thin and delicate; asci numerous, 15–20 or more; sporidia uniformly 4–6, much smaller than in the type. The name *E. sepulta* has been provisionally proposed for this form by Ellis and Everhart,

Bot. Gaz. xiv, p. 286, but without an adequate description. The characters given above would suggest a relationship to *E. communis* rather than to *E. cichoriaccarum*, but no forms of that species have so far been reported on *Compositæ*.

CYLINDROSPORIUM ACERINUM T. & E.

No. 5917. August 27, Marysvale, Utah, 8000° alt.

On *Acer glabrum*.

Spots yellowish, small, irregular, not bordered; acervuli epiphyllous, large, black, scattered; spores strongly curved, hyaline, granular, 35–40x1½–2 m.

LOPHIDIUM INCISUM E. & E.

No. 5754. August 9, Fish Lake, Utah, 9000° alt., in gravel.

On *Symphoricarpus oreophilus*. Perithecia erumpent-superficial, sometimes subseriate or subconnate, depressed globose, black, ½ to ¾ mm. diam., at first rounded at the apex, without any appearance of an ostiolum, then gashed or cleft across the top and the broad compressed ostiolum rising from the bottom of the cleft, or sometimes (in the early stage of growth) 3–4 radiate-sulcate-cleft at the summit. Asci cylindrical, 120 to 150x12–14 m.; short stipitate, 6–8 spored, with abundant, filiform paraphyses. Sporidia uniseriate, oblong-elliptical, 5–6 septate and muriform, 23–27x12–14 m. This has the habit of *Cuburbitaria*.

All localities given in this article are in Utah, unless otherwise stated.

ERRATA.—Page 613, line 14, for *Astragalus foliosus* read *A. foliolosus* (Gray) Sheldon; erase "Sheldon, not Gray."

Page 622, line 21, for *Erysimum pumilum* var. *perenne* read *E. aspeum* var. *perenne*.

Page 632, next to last line, for "woods" read "woody."

ERRATA.

Page 627, after var. tripartitum (Nutt.) add Pax.
Page 638, read *Tejonensis* for *Tejouensis*.
Page 639, read *debilis* for DEBILIS.
Page 645, read A. PISCINUS for *piscinus*.
Page 650, read var. UNGULATUS for var. *ungulatus*.
Page 655, read A. STIPULARIS for *stipularis*.
Page 658, read A. ENSIFORMIS for *ensiformis*.
Page 670, read A. UINTENSIS for *Uintensis*.
Page 666, read A. METANUS for *A. metanus*.
Page 667, read A. JULIANUS for *A. Julianus*.
Page 693, line 25, read cannot for caunot.
Page 693, lines 4, 5, 23, read *Macronema* for *macronema*.
Page 703, line 23, read var. *tenella* for *L. tenella*.
Page 716, *Eriogonum* should be placed on page 718.
Page 719, read GLUTINOSUM for *glutinosum*.
Page 719, read AMBIGUUM for *ambiguum*.
Page 727, read *Glycyrrhizæ* for *glycyrrhizæ*.
Page 730, line 5, *drabæ* should be *Drabæ*.
Page 731, line 22, *cichoricearum* should be *cichoriacearum*.
Page 732, next to last line, *aspeum* should be *asperum*.

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